OPPORTUNITIES FOR BUSINESS GRAPHICS SERVICES AND SOFTWARE

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mendations and innovative idea

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OPPORTUNITIES FOR BUSINESS GRAPHICS SERVICES AND SOFTWARE

TABLE OF CONTENTS

Page

I INTRODUCTION 1
- A. Purpose 1
- B. Research And Methodology 3

II EXECUTIVE SUMMARY 5
- A. Introduction 5
- B. Key Results 8
- C. Recommendations 16

III BUSINESS GRAPHICS OVERVIEW 19
- A. Recent Growth 19
- B. Major Applications 21
- C. Pricing 23
- D. Benefits 25
- E. User Expectations 27

IV BUSINESS GRAPHICS IMPLEMENTATION 31
- A. Present Methods Of Use 31
- B. Systems Features 34
- C. Users Of Business Graphics 37
- D. Equipment 39
  - 1. General 39
  - 2. Interactive Graphic Displays 40
  - 3. Hardcopy Output Devices 42
- E. Software 44
  - 1. Introduction 44
  - 2. Sources Of Software 45
    - a. How Software Is Supplied 45
    - b. Independent Software Vendors 45
    - c. Equipment-Vendor-Supplied Software 47
    - d. RCS-Vendor-Supplied Software 50
  - 3. Adequacy Of Business Graphics Software 51
  - 4. Data Bases 53
  - 5. Graphics Standards Planning Committee 56

V BUSINESS GRAPHICS MARKET 59
- A. Current Activity 59
- B. RCS Vendors - Mode Of Delivery 60
- C. Market Forecast 62

Page

VI COMPETITIVE ENVIRONMENT 67
- A. Present And Future Competition 67
- B. Vendor Recognition 71
- C. Product Marketing 71

APPENDIX A: DESCRIPTION OF RESPONDENTS 75

APPENDIX B: RELATED INPUT REPORTS 77

APPENDIX C: QUESTIONNAIRES 79
- User 79
- Vendor 90

OPPORTUNITIES FOR BUSINESS GRAPHICS SERVICES AND SOFTWARE

LIST OF EXHIBITS

			Page
I	-1	Illustrations Of Business Graphics	2
II	-1	Traditional RCS Graphics Services Delivery Methods	6
	-2	Recently Developed RCS Graphics Delivery Method	7
	-3	Competition Encountered By Vendor Respondents	9
	-4	INPUT Forecast of RCS Revenues From Business Graphics	10
	-5	Expected Sources Of Business For Vendor Respondents	12
	-6	Management Emphasis In Applications Of User Respondents	13
	-7	Business Graphics Features Rated By Users	15
III	-1	User Applications Of Business Graphics	22
	-2	Growth In Use Forecast From 1981 To 1985	24
	-3	Benefits Of Business Graphics	26
	-4	Price Versus Quality Rated By Users	28
IV	-1	How Users Produce Business Graphics	32
	-2	Evolving Business Graphics System	35
	-3	Rating Of Features By Vendors And Users	36
	-4	Requirements For Interactive Use	38
	-5	A Brief Contrast Of Displays	41
	-6	Software Used For Business Graphics	46
	-7	Integrated Software Systems Corporation (ISSCO) Summary Of Current Users' Group	48
	-8	Average Rating Of Software By RCS Vendors	52
	-9	Evaluation Of Graphics Software	54
	-10	Requirement To Use DBMS	55
	-11	Data Used In Graphics Applications	57
V	-1	Percent Of Business Graphics Revenue By Delivery Method	61
	-2	Market Potential For Business Graphics	63
	-3	Forecasts Of Computer Business Graphics Income	65
VI	-1	Competition Perceived By RCS Vendors	68
	-2	Source Of Expected Competition	70
	-3	Recognition Of Vendors By User Respondents	72

Page

A -1 Industry Breakdown Of Business Graphics Users Surveyed 75
-2 Profile Of RCS Vendor Respondents 76

B -1 Related INPUT Reports 77

I INTRODUCTION

I INTRODUCTION

A. PURPOSE

- This report, produced by INPUT as part of the Management Planning Program in the Information Services Industry, analyzes the market opportunities for business graphics services and software offerings.

- For this study, business graphics is defined as a graphical method of analyzing or presenting data for business management purposes.

  - Business graphics uses techniques borrowed from applied mathematics, statistics and graphic arts to present data. As Exhibit I-1 illustrates, these include pie charts, histograms, graphical plots, etc. Color is being used with these techniques in many situations.

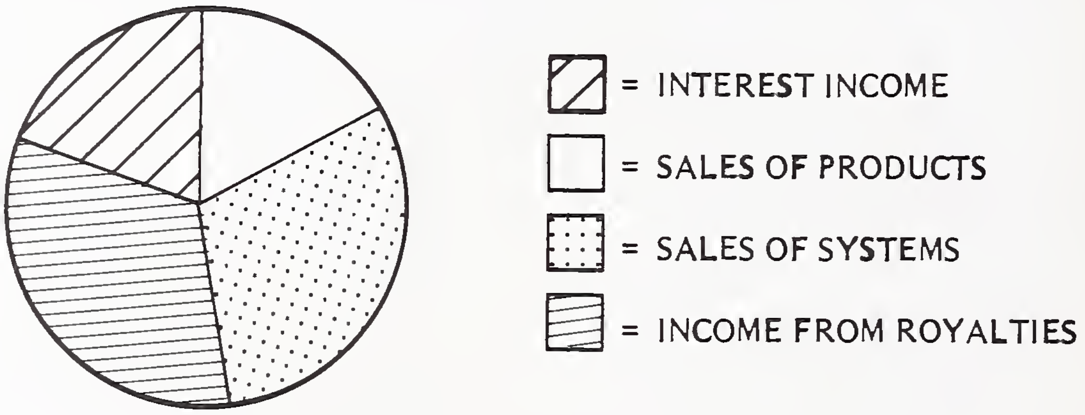
  - An illustration of the use of business graphics might be a rapid review of revenue by district for a management group (see Exhibit I-1). Trends by district can be seen at a glance; otherwise it would be necessary to reread the report and consider each district separately.

- Clients have expressed a high level of interest in this rapidly developing market.

EXHIBIT I-1

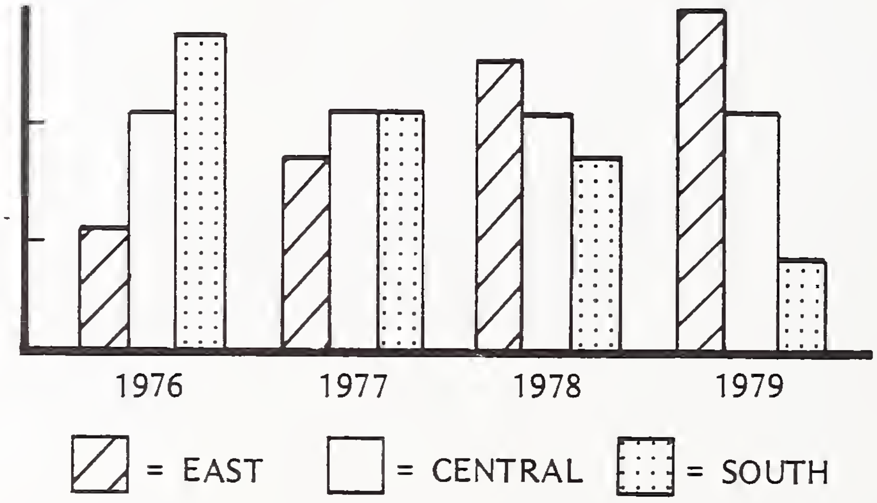
ILLUSTRATIONS OF BUSINESS GRAPHICS

PIE CHART FOR COMPONENTS OF REVENUE

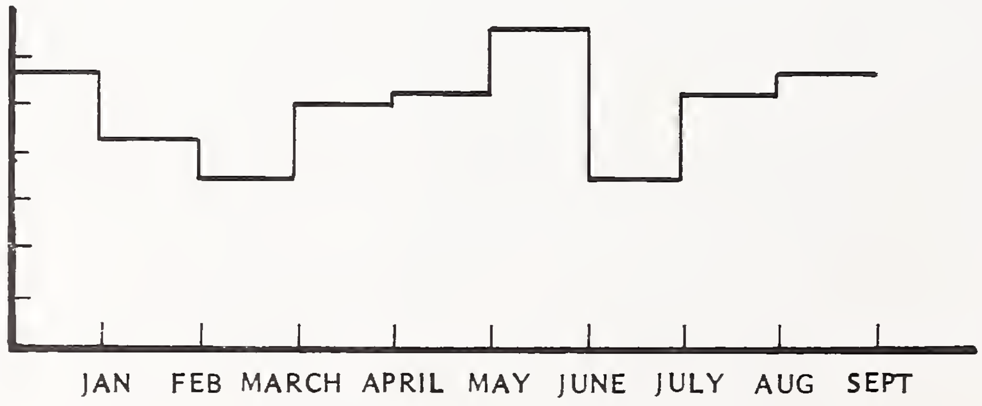


REVENUE BY DISTRICT

REVENUE IN SOME MULTIPLE OF $000,000



SCALE IN $ AND ¢



MONTHLY COST OF XY

- The primary objectives of this study were to review this developing market and recommend how remote computing services (RCS) companies can take advantage of opportunities stemming from the apparent high demand of users.

B. RESEARCH AND METHODOLOGY

- The research for this study was based on two questionnaires developed by INPUT and utilized during interviews with 10 RCS vendors and 20 business graphics users.
  - The scope of the research was enhanced by conducting other informal interviews with selected equipment, software and professional services vendors.
  - All vendor interviews were conducted by INPUT senior staff.
- The vendors included in this research had annual revenues for processing services ranging in size from $13 million to over $400 million, with average revenues per vendor of $77 million.
- All vendor respondents were management or senior staff personnel.
- The business graphics users included in this research were selected from industries believed to have the largest market potential for business graphics. Those industries are listed in Appendix A.
- All user respondents had a direct knowledge of, and involvement with, business graphics for their respective firms.
- Interviews were conducted betwen January 28 and February 11, 1981.

- In addition, INPUT conducted an extensive review of relevant vendor and trade literature.

- The base year for forecasting is 1980.

- Clients' inquiries and comments on the information presented are welcome.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. INTRODUCTION

- Graphical techniques have been used in business computing applications for some time, generally in operational analysis, management science and statistical applications. RCS vendors met this need as shown in Exhibit II-1.

- Recent developments in graphical techniques, including the use of color, have moved from technical areas to government and business offices.

- The use of these techniques appears to be meeting a major need of business, namely the ability to explain and present complex relationships of data. Demand for business graphics has climbed rapidly.

- The decreasing costs of technology and the provision of better software capabilities for computer graphics have fueled the boom in interest.

- RCS vendors are using new software with traditional approaches as well as with the approach shown in Exhibit II-2 to meet this need.

- Some difficulties have been encountered in the use of computer business graphics:

EXHIBIT II-1

TRADITIONAL RCS GRAPHICS SERVICES DELIVERY METHODS

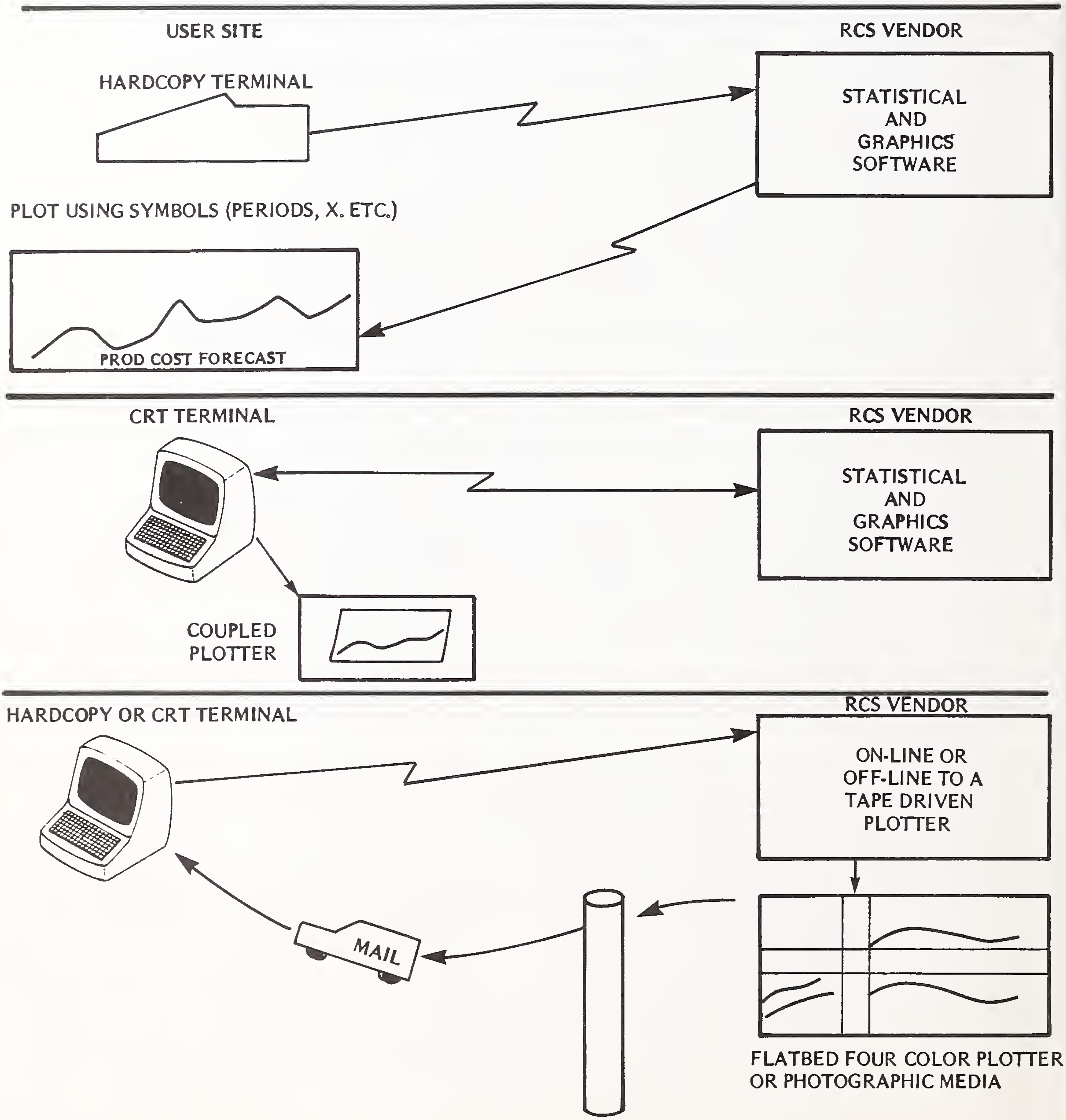
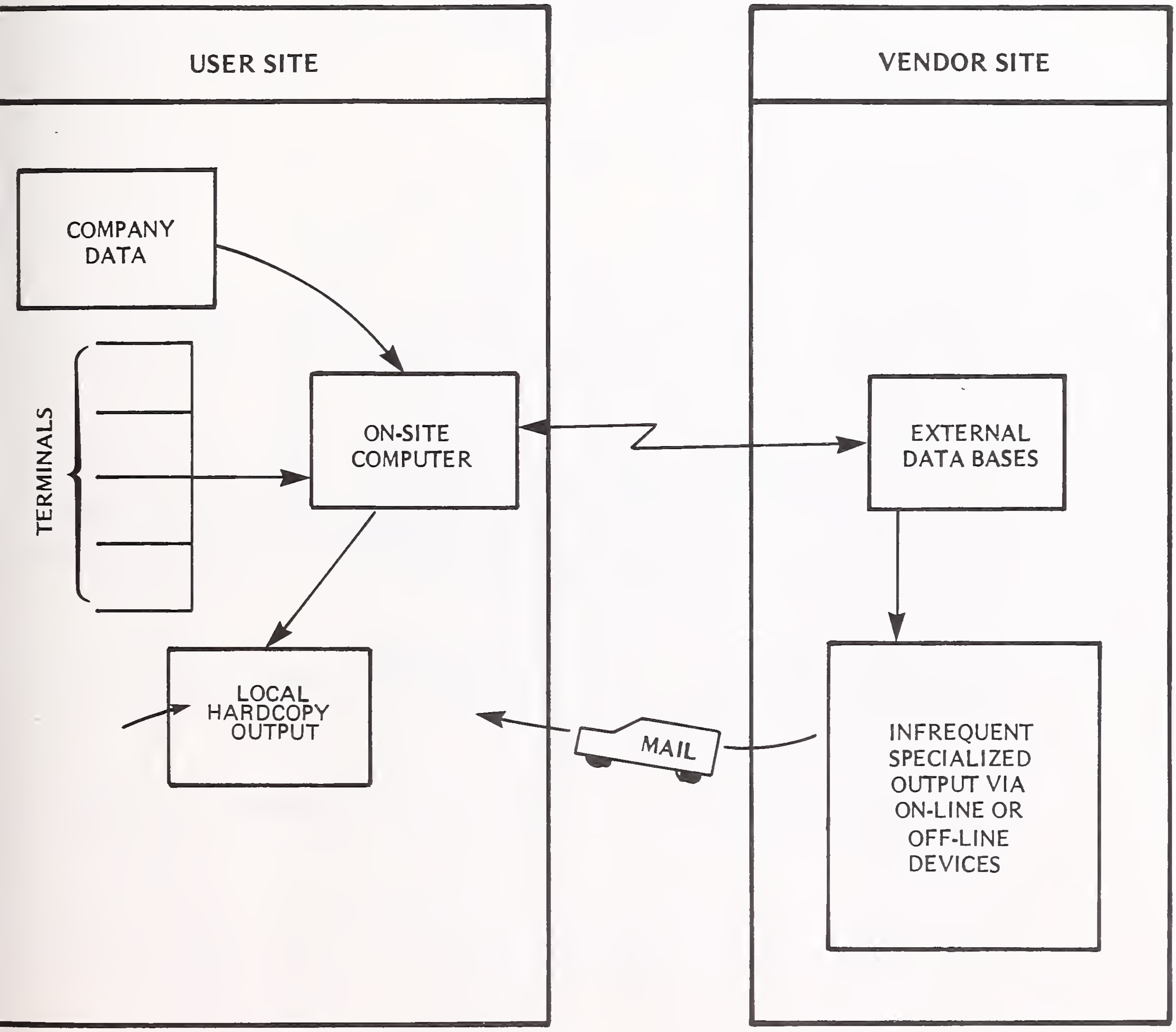

USER SITE
RCS VENDOR
HARDCOPY TERMINAL
STATISTICAL AND GRAPHICS SOFTWARE
PLOT USING SYMBOLS (PERIODS, X. ETC.)
PROD COST FORECAST
CRT TERMINAL
RCS VENDOR
STATISTICAL AND GRAPHICS SOFTWARE
COUPLED PLOTTER
HARDCOPY OR CRT TERMINAL
RCS VENDOR
ON-LINE OR OFF-LINE TO A TAPE DRIVEN PLOTTER
MAIL
FLATBED FOUR COLOR PLOTTER OR PHOTOGRAPHIC MEDIA

EXHIBIT II-2

RECENTLY DEVELOPED RCS GRAPHICS DELIVERY METHOD



  - There is a lack of personnel with relevant backgrounds in graphics techniques or programming to meet needs.

  - Color hardcopy equipment has not been available at reasonable prices.

  - It is difficult to provide interfaces between graphical software and some files of internal data or external data bases.

  - Quality of output on displays, plotters or hardcopy devices involves new maintenance questions.

B. KEY RESULTS

- There are many equipment vendors in the computer business graphics market and competition is now at a high level.

- The demand for business graphics and for vendor firms with expertise in related applications and software is growing large in comparison to the available supply. Consequently, RCS vendor respondents perceive competition to be low in general, as shown in Exhibit II-3.

- Competition is expected to grow, and all respondents expect the business to be highly competitive by 1985.

- Between 1980 and 1985, vendor respondents expect an average annual growth rate of 44%.

- This growth would result in an increase from a present estimate of $125 million to $774 million, as shown in Exhibit II-4.

- Factors supporting this rate of growth include the growth rate of the computer graphics industry as a whole between 1976 and 1980, the level of unfilled need

EXHIBIT II-3

COMPETITION ENCOUNTERED BY
VENDOR RESPONDENTS

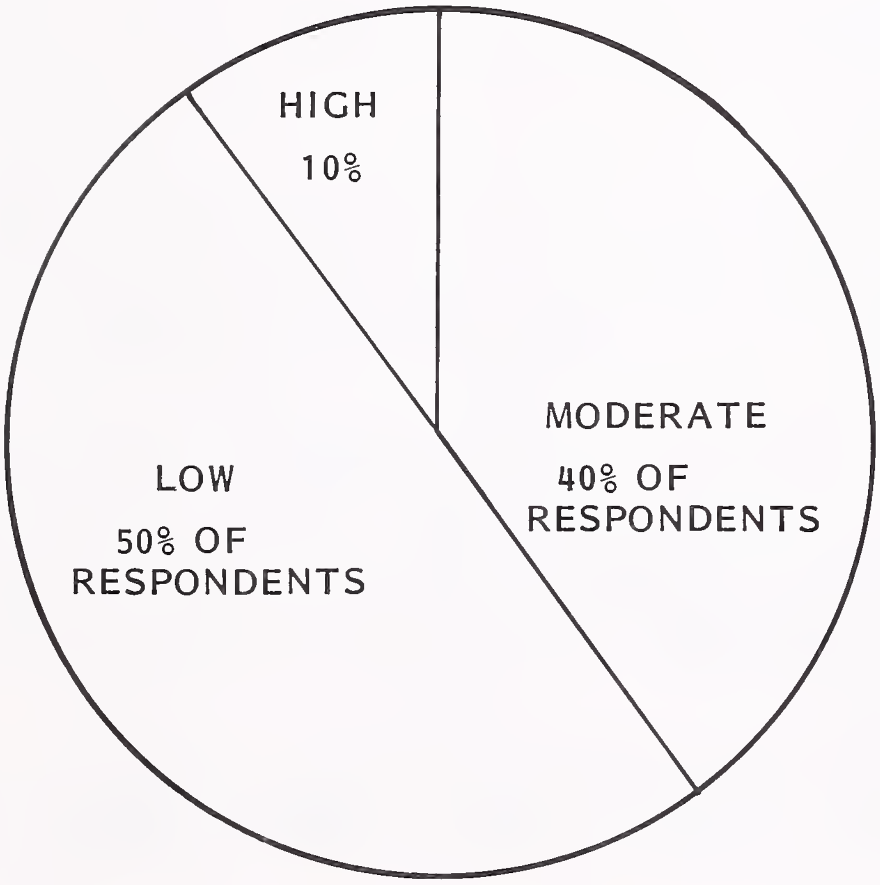
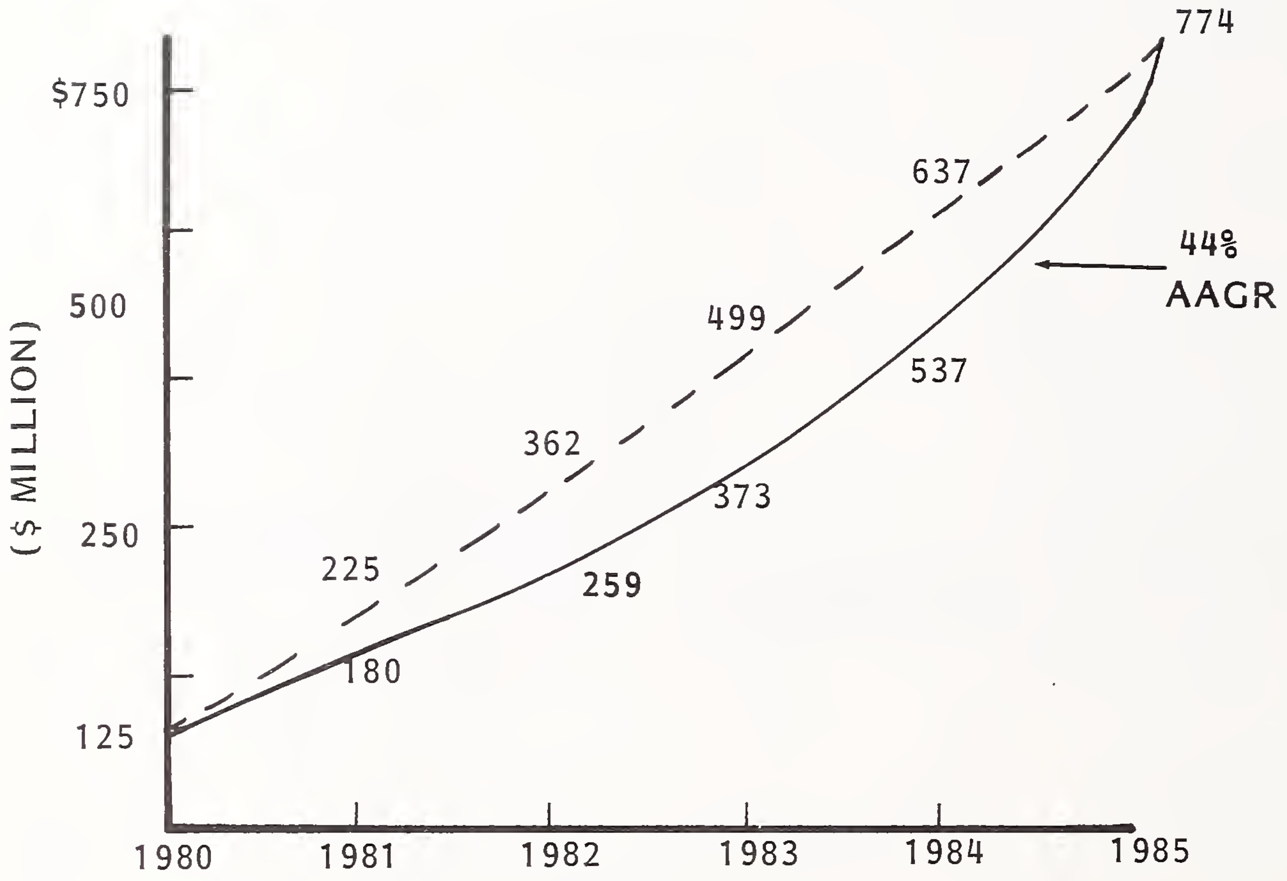


EXHIBIT II-4

INPUT FORECAST OF RCS REVENUES FROM BUSINESS GRAPHICS



– – – – = 80% AAGR FROM 1980 TO 1981 AND A STRAIGHT LINE GROWTH FROM 1981 TO 1985.

indicated by user respondents, and the short-term rate of growth forecast by some vendor respondents.

- According to a variety of industry sources, the computer graphics industry grew rapidly (nearly 50% AAGR) in non-business areas from 1976 through 1980 and is expected to grow at a lower AAGR (about 25%) through 1985.
    - Business graphics is in the first stage of growth for all vendor products and services in comparison to the rest of the graphics industry.
    - Demand seems more pronounced for business applications today, and growth may resemble the period between 1976 and 1980 for the rest of the graphics industry.

- User respondents to this study expect to see a shift from moderate to heavy use for known applications. Overall usage by these respondents could grow at a rate estimated to be between 30% and 50%.

- The short-term rate of growth expected by some vendor respondents is based on contracts or an assessement of potential customers. Forty percent of vendor respondents expect revenues from business computer graphics to grow by a rate of between 65% and 100% during the next year.

- The sources of business for vendor respondents are shown in Exhibit II-5. Financially oriented industries - banking, securities, and insurance - account for 50% of the sources.

- The applications of user respondents and benefits attributable to these applications, shown in Exhibit II-6, emphasize the involvement of management in business graphics.

- Savings in management time at presentation or planning meetings together with improved results from better decision-making could generate considerable payback in the use of graphics.

EXHIBIT II-5

EXPECTED SOURCES OF BUSINESS FOR VENDOR RESPONDENTS

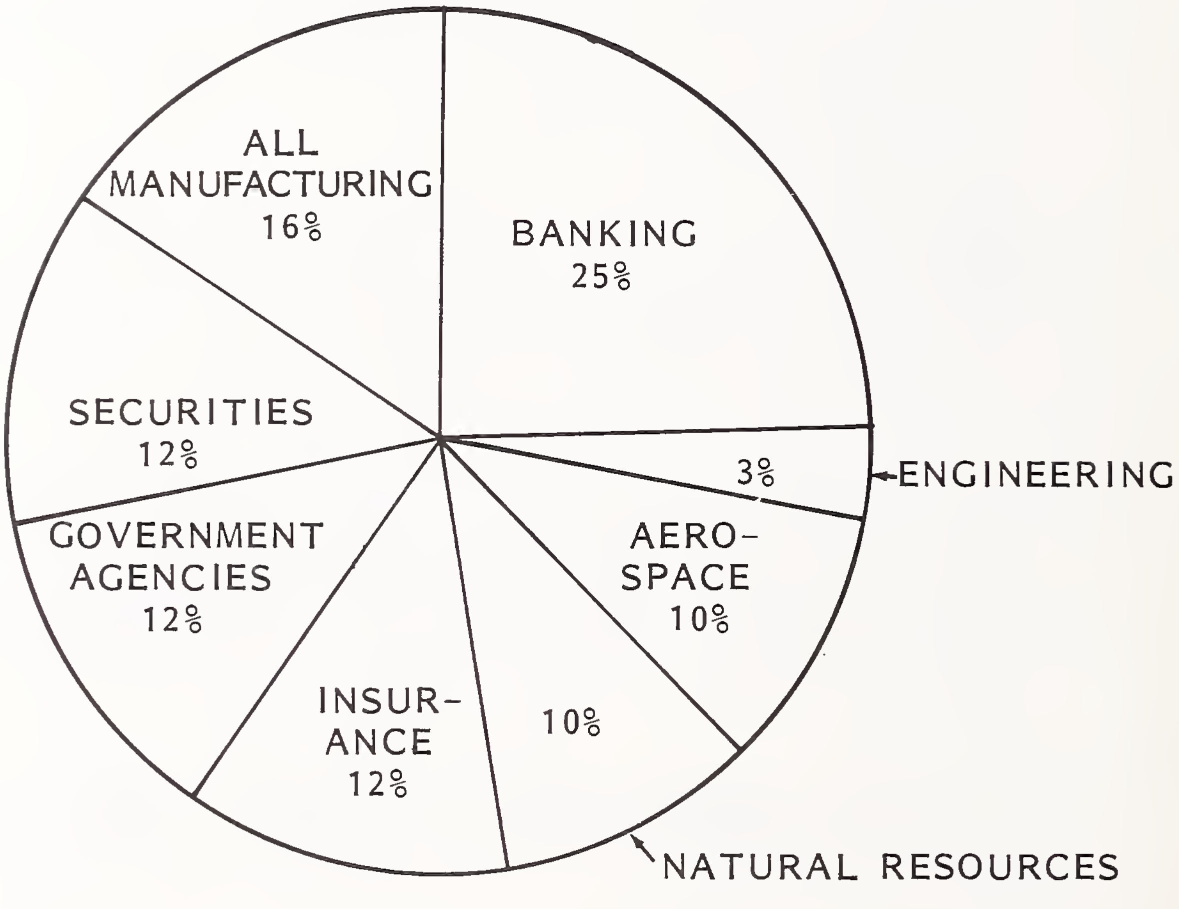


EXHIBIT II-6

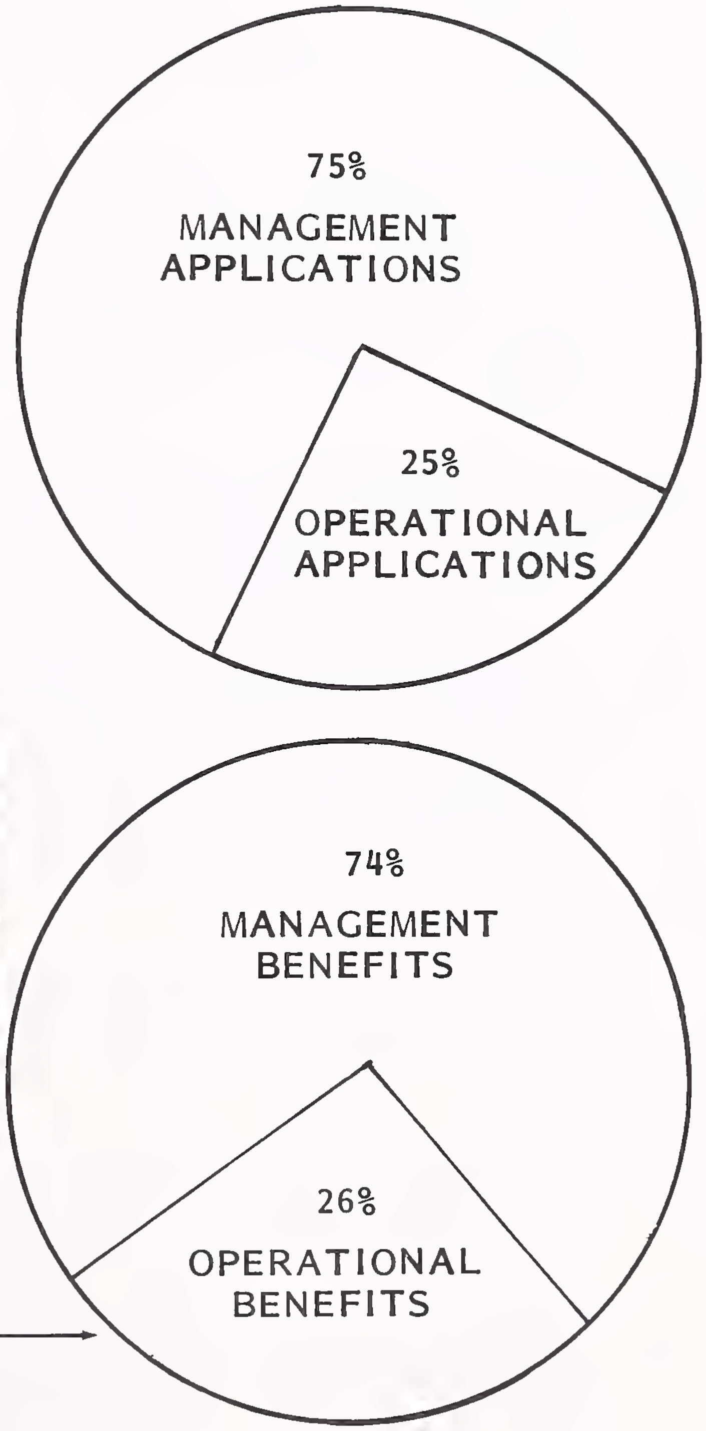
MANAGEMENT EMPHASIS IN APPLICATIONS OF USER RESPONDENTS

- FINANCIAL ANALYSIS
- PLANNING AND FORECASTS
- MARKETING PLANNING

- COMMUNICATION OF RESULTS
- AID TO DECISION-MAKING
- COMPARISON OF ALTERNATIVES
- INCREASED PRODUCTIVITY

- REDUCED ANALYSIS WORK
- REDUCED PAPERWORK

MANAGEMENT VERSUS OPERATIONAL APPLICATIONS



MANAGEMENT VERSUS OPERATIONAL BENEFITS

- Experience and knowledge will be required to select appropriate graphics techniques and implement them successfully and with quality.

- Quality is a major factor since management is involved. Eighty-two percent of user respondents felt that quality is more important than price.

- Although user respondents rate the availability of color in displays and output as fourth in importance, as shown in Exhibit II-7, many users expect color to be utilized and assume business graphics means the use of color.

- The availability of software aids and techniques to help user development of graphics are of high interest to user respondents. Interactive use, response time, and system flexibility, as noted in Exhibit II-7, support user development also.

    - Other requirements supporting this need noted by users during interviews included menus to aid input and English language capabilities.

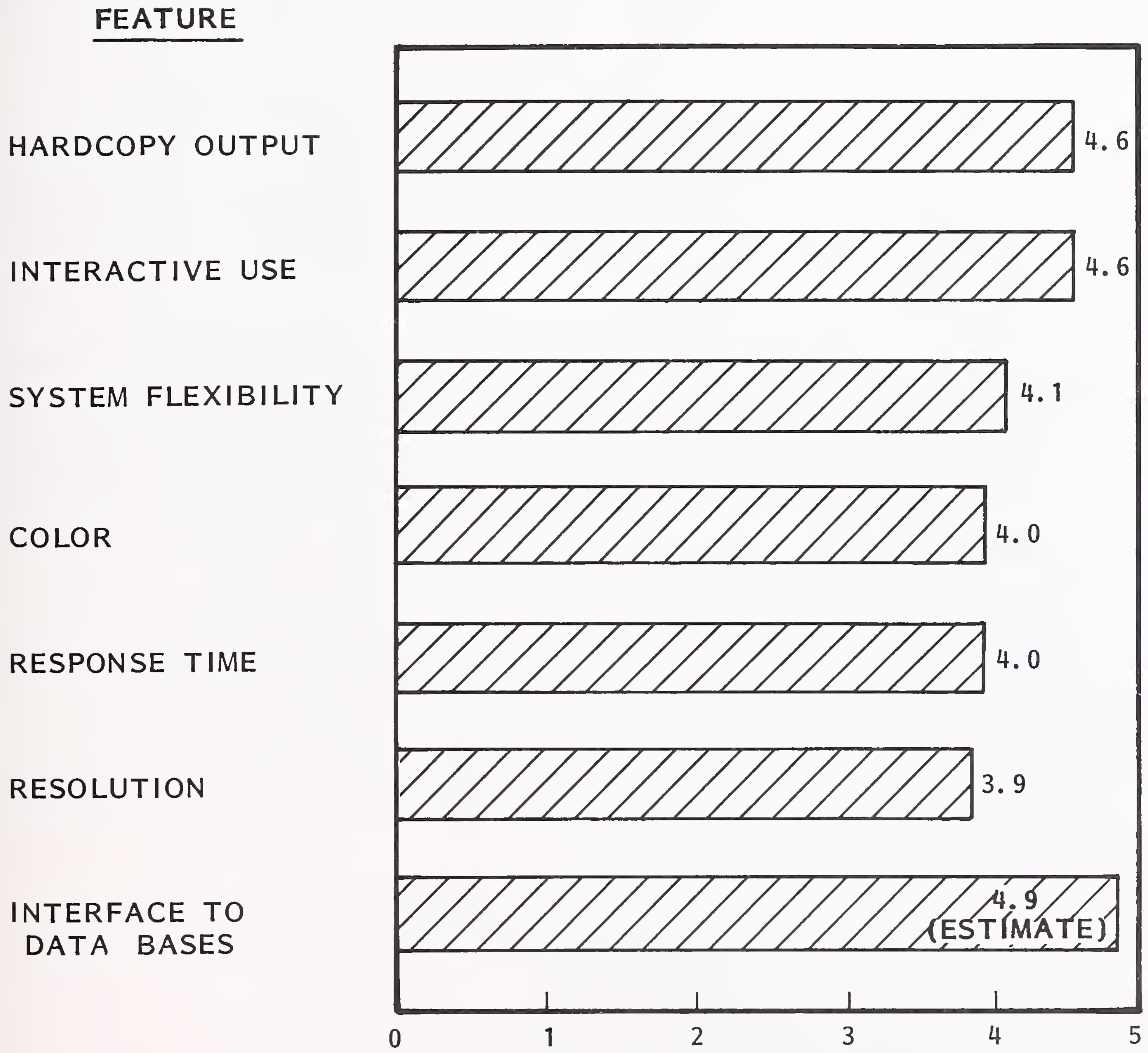
- In addition to development aids, there are needs for programming aids to customize applications and interface graphics software to internal and external data bases. The lack of personnel to meet this need will limit the growth of business graphics.

    - These limitations could well be met through the services of RCS vendors.

- The hardcopy output feature noted in Exhibit IV-7 refers primarily to one of the capabilities that has limited progress in business graphics - the provision of economic, quality output of color graphics. IBM, Xerox and other manufacturers have introduced units to address this need but additional developments may be called for to satisfy this requirement.

EXHIBIT II-7

BUSINESS GRAPHICS FEATURES RATED BY USERS



MODERATE RATING 3
HIGH RATING 5

C. RECOMMENDATIONS

- RCS vendors should choose one of two roles for business graphics:
  - The integration of business graphics with other product offerings, particularly data base capabilities.
  - The use of business graphics capabilities and expertise as a product offering of current interest which could open doors, generate income by itself and lead to the sale of other products.
- The second role offers more profit potential from computer graphics but will require experienced people with knowledge of graphical techniques and the possession of hardware and software capabilities that meet user expectations, as described in Section II.B.
- If vendors choose the second role, they should consider marketing consulting services to help customers utilize business graphics. Consulting aid could be sold only to those customers who are using, or are likely to use other services of the RCS vendor, such as access to proprietary data bases, financial modeling languages, etc.
- Even when companies state that they are going to develop an in-house capability, there are opportunities for RCS vendors to market services.
  - Education and aid in selecting business graphics applications could be sold as a consulting service.
  - Systems and programming work and aid in choosing software packages and hardware could also be sold.
  - Remote processing services might be sold on an interim basis until the company is ready to install and use its own capability.

  - The use of vendor data bases might be promoted and tied in to graphics applications to provide a background or reference to in-house data. This service would continue after the graphics processing moves in-house.

  - During this process, the company might well decide to continue to use the RCS vendor rather than support this application in-house.

- The first role, noted above, would require that the RCS vendor possess sufficient hardware and software knowledge so that graphics capabilities could be integrated with the use of data bases, financial modeling languages, financial analysis systems, etc. Customers will want one set of related high-level commands to link all of a vendor's products.

- The background and capabilities required in either role would include:

  - Knowledge of the software provided by ISSCO (Integrated Software Systems Corporation) which was used by 50% of user respondents as well as 50% of vendor respondents. Some users may want to stay independent of RCS vendors by using this software.

  - Use of software graphics packages that incorporate English language commands, user friendly response, menu techniques for input, and interfaces to other vendor packages, particularly to data bases.

  - Software capabilities that facilitate linkages to internal data or the use of customization.

  - Hardware and software capabilities that are device independent and permit the use of color displays and provision of color output.

  - Experience with the displays and plotters commonly used as customer workstations.

- The second role, noted above, would also require that RCS vendors maintain current knowledge of new software offerings, new color displays and particularly color output devices, since development is needed and anticipated with these devices.

- The use of interactive sessions, which utilize menus on a display screen to develop graphics applications, as well as the need to interface internal and external data are promoting the use of an on-site computer as a graphics processor. This computer, which could be a mini- or a microcomputer would be connected to the RCS vendor and able to receive data, on-line or off-line via magnetic tape, for example, from the internal center.

- RCS vendors who plan to have a graphics capability should consider offering an on-site graphics processor. By 1985, RCS respondents to this study expected 20% of their business graphics revenue to be generated by this capability.

- RCS vendors who choose the second role recommended for this market could be prepared to sell the on-site graphics processor on a turnkey basis and provide continuing support and use of proprietary data bases.

III BUSINESS GRAPHICS OVERVIEW

III BUSINESS GRAPHICS OVERVIEW

A. RECENT GROWTH

- A number of applications of graphics to business problems have been made on computers. The older applications were generally concerned with:
  - Statistical analysis.
  - Operational aids.
    - Break-even analysis.
    - Learning curve.
    - PERT and CPM.
    - LOB.
  - Management science analysis.
- RCS vendors have made notable contributions to business graphics during the past 10 years.

  - ADP has introduced and expanded graphical capabilities in the APECS, project evaluation and control system, econalyst, business and economic analysis system and other systems. ADP also has a package that can be used for graphical presentation.

  - CSC offers six graphics packages, which are used in scientific and business applications.

  - The Executive Information Services System of Boeing Computer Services offers graphics output capabilities for financial modeling and data base, statistical and other processing capabilities.

- Despite the existence of graphics products, there is a feeling that business graphics is a new industry. A number of vendor respondents noted that the industry seems to be less than a year old although it has existed for some time.

- There has been a recent surge of graphical applications concerned generally with graphical presentations of data for management use. These applications have been fueled by:

  - The development of new graphical techniques, including the use of color, to serve engineering and scientific applications.

  - A growing awareness of these techniques in government and industry (reasons for this will be suggested in Section IV).

  - The reduction in prices for the technology which can produce the "new" graphics. (This includes a reduction in price for computing as well as for color terminals, digitizers, etc.)

  - The development of software that facilitates the production of graphics.

- The development of English language capabilities in software has been sufficient to encourage management and staff personnel to create their own computer graphics without relying on data processing. Considerable development in software is still required, however.

- Software is being developed to interface internal and external data bases to graphics processing.

- Manufacturers are addressing the need for economic creation of hardcopy of color graphics.

- New publications, seminars, and advertising are focusing upon the use of computer graphics by business.

- Business users have not only become interested in using the new graphics capabilities, particularly color, for presentations and explanations of data, they want to apply these techniques to the older uses as well.

- Simpler graphical techniques and black and white charts will obviously continue to be used since they cost less, can be produced more easily or quickly and meet the need of some business applications.

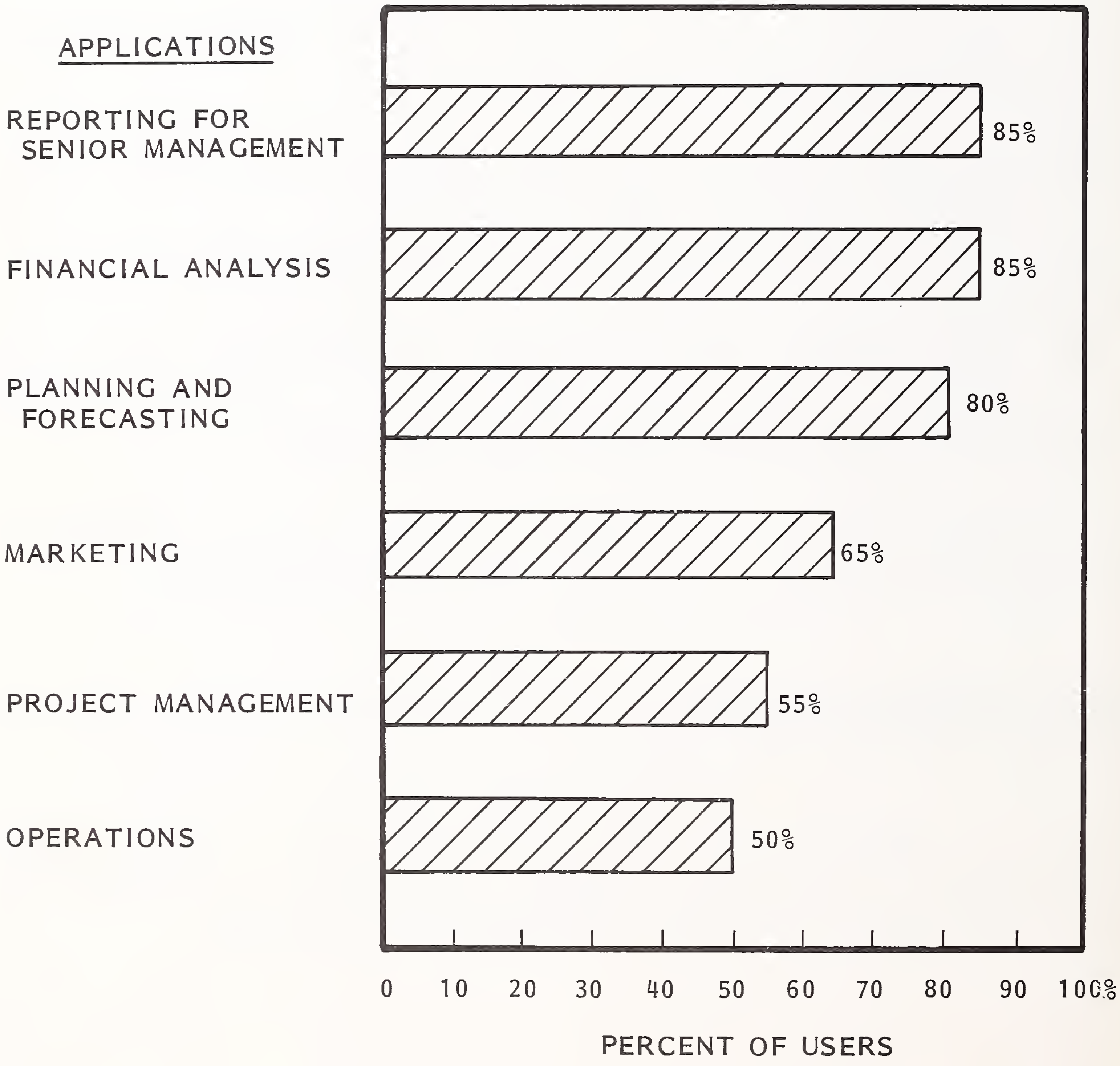
- Vendors should keep in mind that many prospects will want to consider only color displays, hardcopy and use of the newer graphical techniques.

B. MAJOR APPLICATIONS

- User respondents divided their present applications of computer business graphics into six general categories. The percent of respondents with applications in each of these categories is shown in Exhibit III-1.

EXHIBIT III-1

USER APPLICATIONS OF BUSINESS GRAPHICS



- Two categories are concerned with financial data. The first is concerned with reporting it, and the second with analysis of it by lower levels of management generally.

- Respondents were also asked if they could forecast a growth in use of any of these applications between 1981 and 1985. The results obtained are shown in Exhibit III-2.

- Although reporting for senior management and financial analysis should continue to be major application areas, other areas, particularly marketing, show greater relative increases in growth.

- This may reflect the fact that the new graphical techniques have been used first in areas of interest to upper management and will be introduced in the future in other areas.

C. PRICING

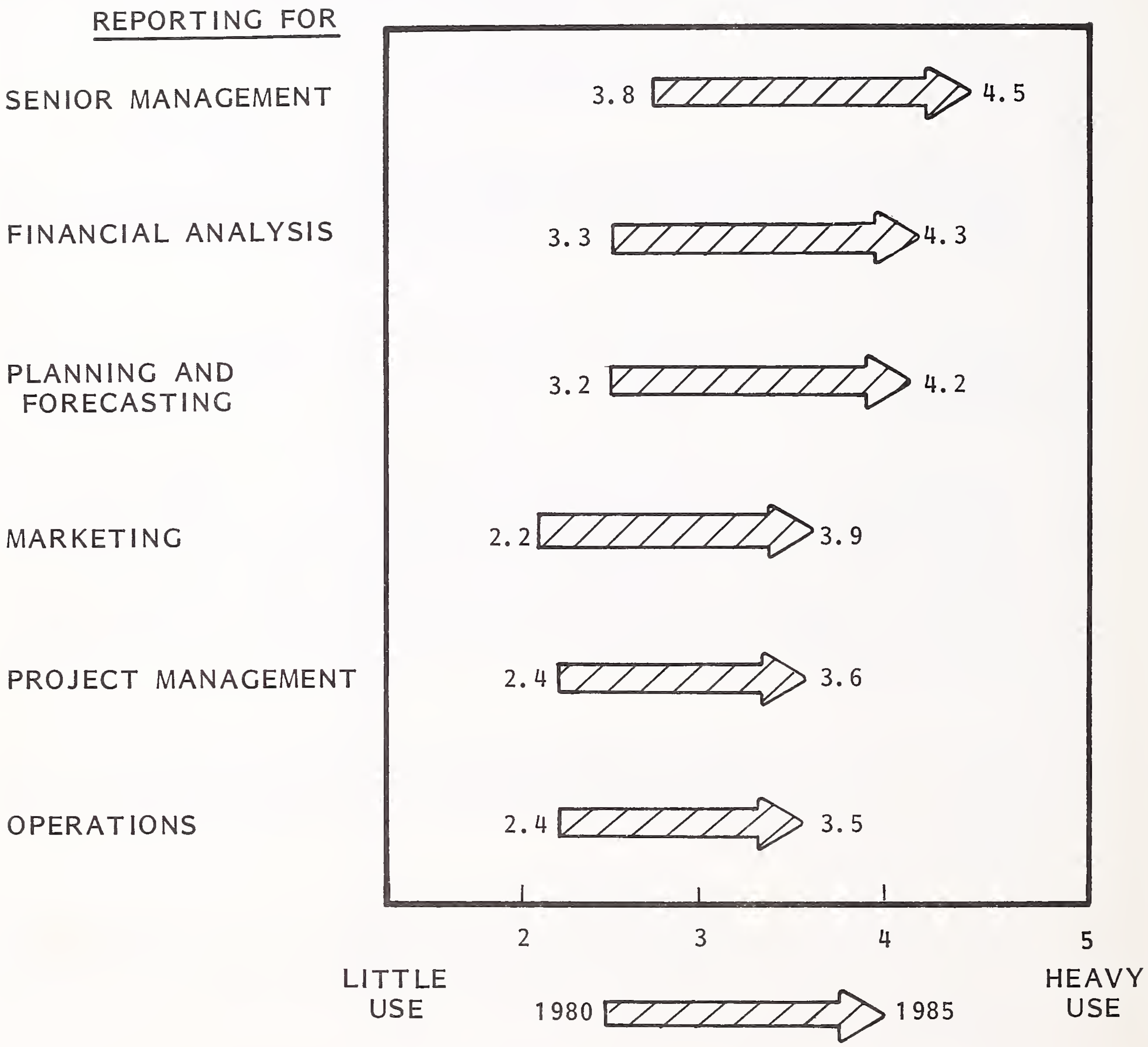
- The cost of business graphics is not separated from the cost of in-house computer applications or timesharing in many cases. User respondents could not generally supply information on total costs for computer business graphics for this reason.

- Only when users purchase hardware systems, peripherals, software packages, turnkey systems or RCS service specifically for business graphics will they necessarily track costs.

- The increasing use of external data bases in graphics work will add another component of cost that users will probably not allocate correctly to business graphics.

EXHIBIT III-2

GROWTH IN USE FORECAST FROM 1981 TO 1985



- Accurate costs for RCS graphics work will be tracked by vendors rather than by users.

- The cost of small microcomputer based systems or desktop systems is now less than $50,000 each.

    - Many of these installations consist of intelligent terminals or workstations connected to large mainframes or remote computing services that handle the processing and storage of data.

- Business graphics systems are being upgraded by many users through the installation of minicomputer based "graphics processors."

    - These systems should range from $50,000 to $300,000.

- Turnkey systems with graphics software are now priced from about $250,000 to over $1 million.

- Users of computer aided design systems often regard business graphics as a natural, and inexpensive, extension of these systems.

- As noted, business graphics systems are regarded by most users as an integral part of their data processing capability, be it in-house, distributed data processing or remote computer services based.

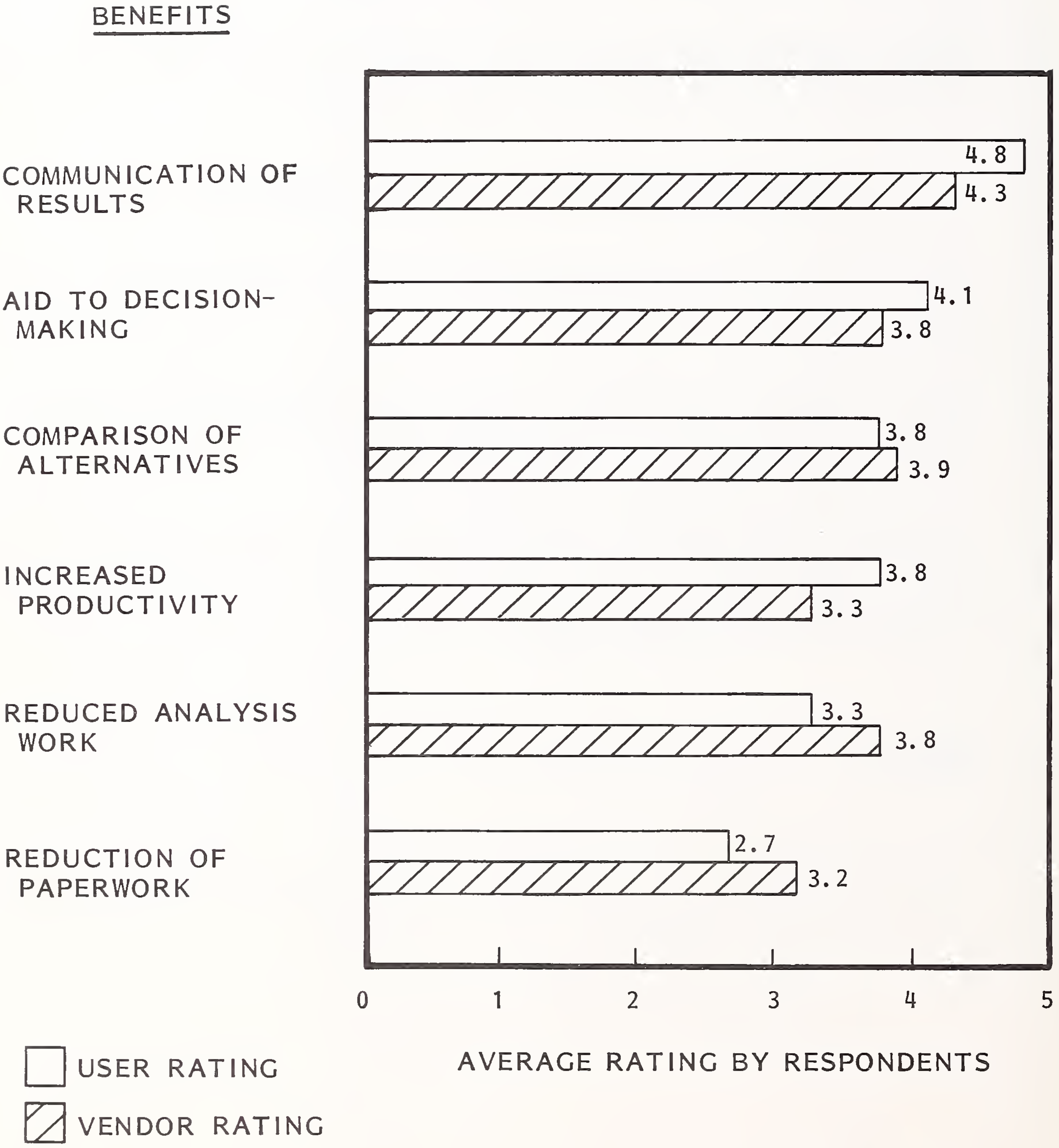
D. BENEFITS

- As noted in Exhibit III-3, the major benefits perceived by users relate to the concerns of top management:

    - Communication of results.

EXHIBIT III-3

BENEFITS OF BUSINESS GRAPHICS



  - Aid to decision-making.

  - Comparison of alternatives.

  - Increased productivity.

- Vendors tend to be close in their perception of user benefits, but they understate the importance of benefits to top management and overstate the importance of reducing analysis and paperwork.

- Users noted that they expected benefits in the first four categories, those of most concern to top management, to increase by 1985. This would exaggerate the difference in vendor perception.

- Users also noted that the benefits attributed to communication emphasized a need for quality.

- When users were asked to rate the relative importance of quality and price, the results shown in Exhibit III-4 were obtained.

E. USER EXPECTATIONS

- Users' expectations for business graphics systems were derived from the general comments they made during interviews. These expectations are not comprehensive but should be of interest to vendors concerned with the field.

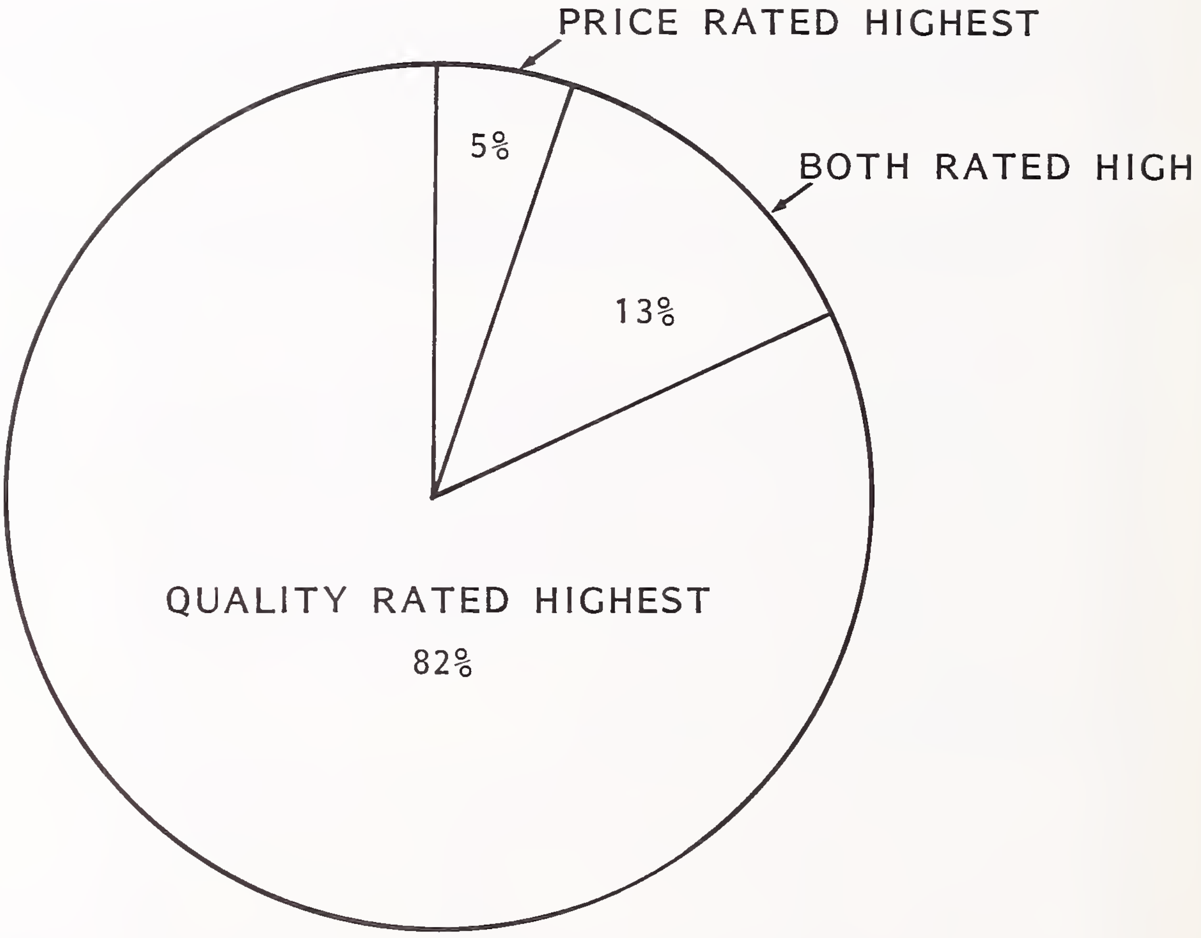
- Users expect business graphics systems to:

  - Be easy to use for non-programming personnel.

  - Have user friendly responses.

EXHIBIT III-4

PRICE VERSUS QUALITY
RATED BY USERS



- Use English language commands.
- Use menu techniques for input.
- Facilitate interactive use.
- Provide flexible formatting.
- Have device independent software.
- Include color terminals.
- Have a means of producing color hardcopy.
- Provide access to internal and external data bases.
- Allow customization to be made by graphics artists.
- Provide high quality output.
- Have good software diagnostics.

IV BUSINESS GRAPHICS IMPLEMENTATION

IV BUSINESS GRAPHICS IMPLEMENTATION

A. PRESENT METHODS OF USE

- As shown in Exhibit IV-1, in-house systems have been the most common means of obtaining business graphics for user respondents.

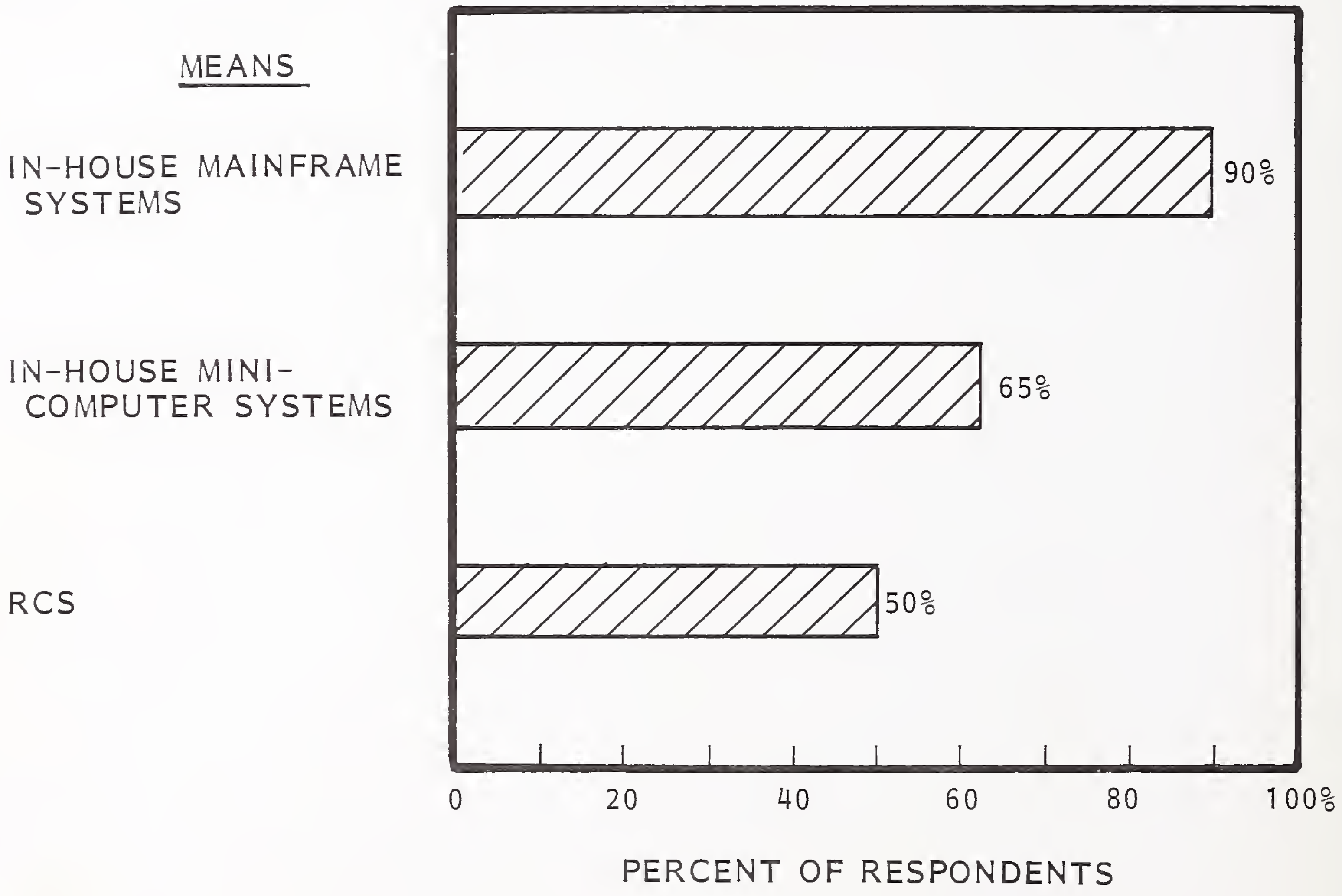
- The computers utilized included machines manufactured by:

  - IBM.*
  - Amdahl.
  - DEC.*
  - CRAY.
  - CDC.
  - Prime.
  - Tektronix.*

  *Indicates that the software used for graphics was supplied by an equipment vendor.

EXHIBIT IV-1

HOW USERS PRODUCE BUSINESS GRAPHICS



- Hewlett Packard.

- Megatek.

- The user workstation for graphics applications generally consists of one terminal display with an alphanumeric keyboard and a plotter for output. Several users have off-line flatbed plotters with four-color capability.

- Sixty percent of these installations use the DISSPLA and TELLAGRAF packages from Integrated Software System Corporation (ISSCO).

- Fifty percent of respondents use RCS vendors including:

  - NCSS.

  - ADP.*

  - TYMSHARE.*

  - DRI.*

  - COMSHARE.

  - GE.

  - McAUTO.

  - Boeing.

  *Denotes the use of graphics software supplied by the RCS vendor.

- It is interesting to note that 90% of these respondents (45% of the total) use both in-house systems and RCS vendors to produce business graphics.

- Present workstations generally include a timesharing terminal and a plotter connected to the RCS vendor's network.

- RCS vendors are beginning to include or consider an on-site computer, as shown in Exhibit IV-2, that would be used as a graphics processor.

- This on-site processor facilitates the use of internal and external data and the provision of menu screens on the display which aids development of graphics applications.

B. SYSTEMS FEATURES

- The importance of systems features were rated by user and vendor respondents, as shown in Exhibit IV-3.

  - User and vendor ratings are similar.

  - All the features, except micrographics output, are rated as important.

- Hardcopy output and interactive use have the highest ratings.

- Other features relate to the quality of the system.

  - Quality is stressed by user respondents.

  - One of the respondents noted: "The graphics quality needs to be so good that you cannot tell it was drawn by a computer."

- Color displays and hardcopy are recognized of importance as well.

  - Many users will assume that business graphics means the use of color is included.

EXHIBIT IV-2

EVOLVING BUSINESS GRAPHICS SYSTEM

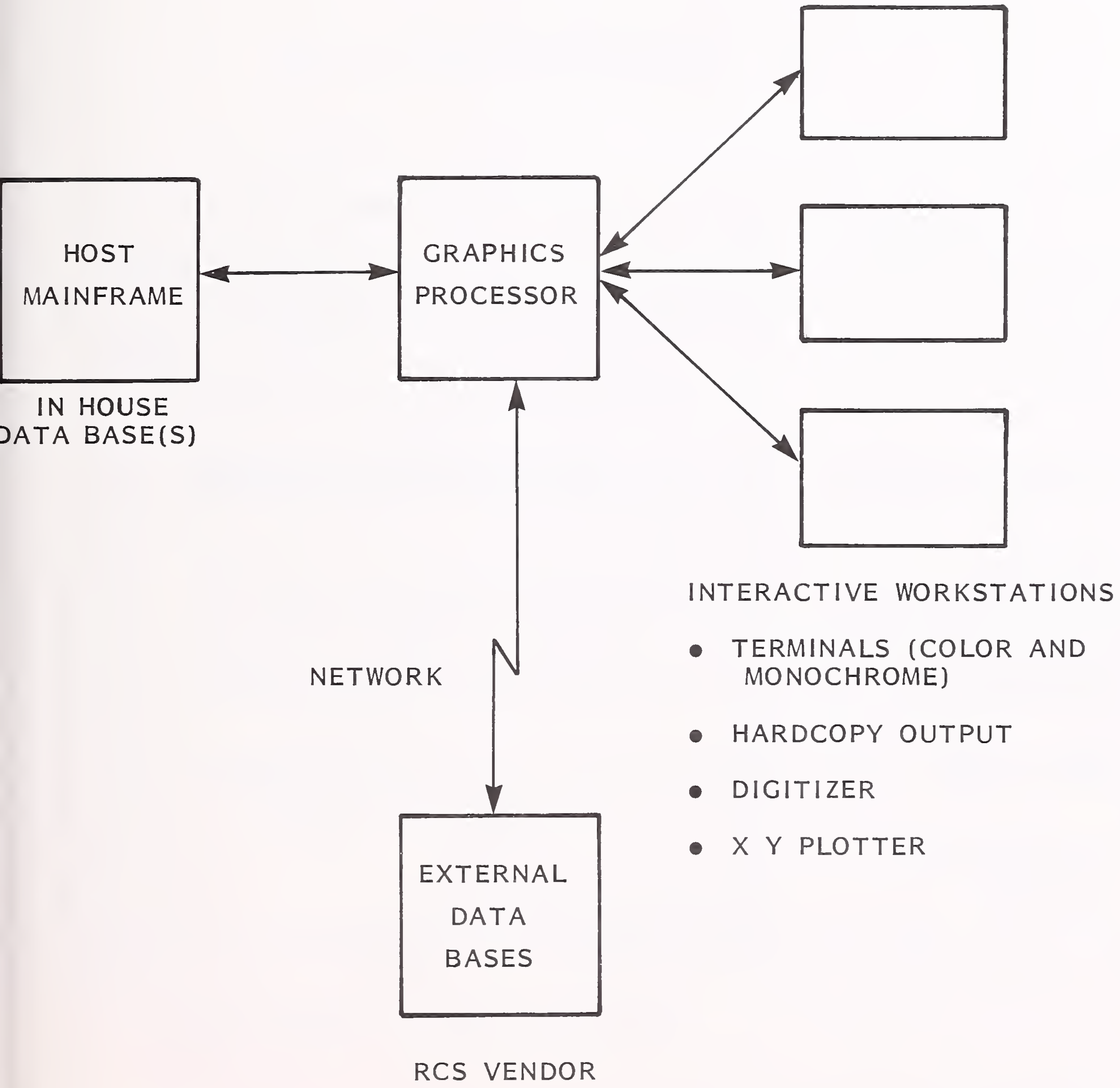
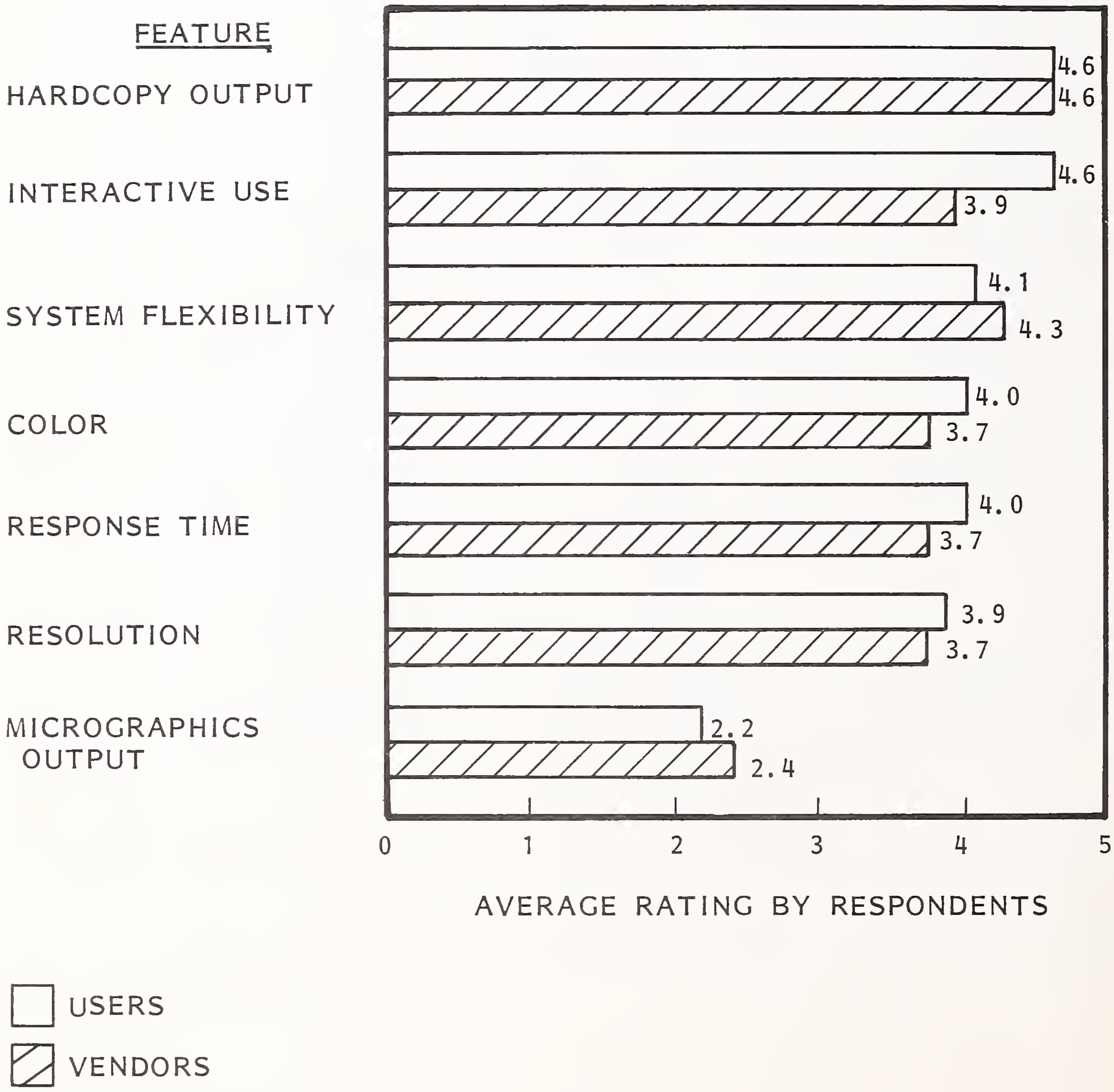


EXHIBIT IV-3

RATING OF FEATURES BY VENDORS AND USERS



  - RCS vendors must be prepared for the demand for color as well as for situations where alternative means will be used.

- The need for micrographics is rated low by user and vendor respondents.

  - Micrographics may be essential to very large users, such as government and industry laboratories, but are not generally used by corporations.

  - Lack of user interest in micrographics could be due to the lack of a cost effective, color micrographics product.

- The present and expected use of interactive capabilities for business graphics systems is rated by user respondents, as shown in Exhibit IV-4.

  - The use of an interactive capability for computer business graphics is important in terms of productivity and cost reduction.

C. USERS OF BUSINESS GRAPHICS

- For some time it was suggested that managers would directly use computer generated management information. A display terminal would be on every manager's desk. This has not taken place for the great majority of managers.

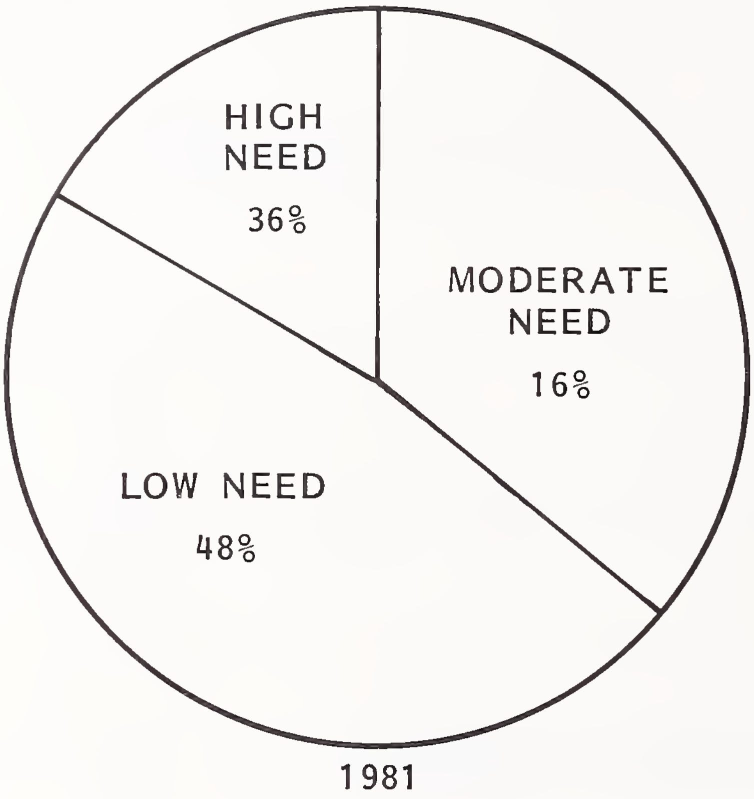
- Managers do not generally use computer graphics systems directly.

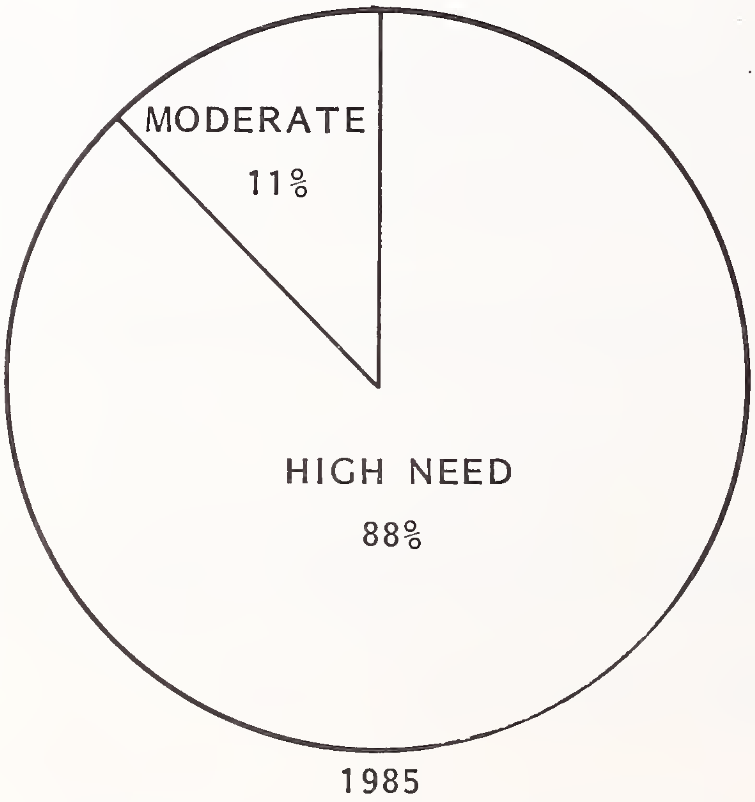
  - There are exceptions.

  - Instances of direct management use were encountered in this study, but in each case, the management user had an analytical background and enjoyed interactive use.

EXHIBIT IV-4

REQUIREMENTS FOR INTERACTIVE USE





RANKED BY USER RESPONDENTS

- Direct users (terminal operators) of computer business graphics are analysts and support staff. Users included:
  - Analysts.
    - Financial, marketing, research, etc.
  - Graphic arts staff.
  - Economists.
  - Clerical personnel.
  - Internal education staff.

D. EQUIPMENT

1. GENERAL

- The peripheral devices, interactive display terminals and hardcopy output devices required to add graphics to a data processing capability have improved to the point where business graphics are economical and technically feasible.
  - Costs have fallen dramatically; e.g., for color raster displays and four-color plotters.
  - The quality of the equipment has improved.
  - There are many capable vendors in the market.
  - Demands on CPU and memory capacity are reasonable.

- There are, however, two improvements needed in the next few years.

  - Improved software tools to reduce the programming task.

  - Improved hardcopy color output devices.

2. INTERACTIVE GRAPHIC DISPLAYS

- Three major types of interactive graphic displays are on the market, offered by over 20 vendors.

  - Raster scan.

  - Calligraphic or vector stroke.

  - Storage tube.

- The display characteristics of these three and two other types are discussed briefly in Exhibit IV-5.

- The use of these display terminals in selected situations could be one of the areas where an RCS vendor could offer consulting aid to business graphic users.

- The major limitation in the use of display terminals at present is the lack of software tools and related hardware features that would facilitate the development of graphics applications.

- Input device types now include:

  - Mechanical units.

  - Light pens.

EXHIBIT IV-5

A BRIEF CONTRAST OF DISPLAYS

RASTER SCAN	CALLIGRAPHIC VECTOR	STORAGE	PLASMA	LIQUID CRYSTAL
DOTTED LINES	SMOOTH, HIGH RESOLUTION LINES	LOW COST AND EXCELLENT QUALITY	SMALLER, SUITED TO CERTAIN ENVIRONMENTS	
MORE STORAGE REQUIRED FOR DATA DISPLAYED	BEST FOR ROTATING THREE-DIMENSIONAL PICTORIALS	NOT AS SHARP AS CALLIGRAPHIC BUT NO FLICKER	EASIER TO ERASE SELECTED LINES	SHOULD NOT AFFECT MARKET BEFORE 1985
SELECTIVE IMAGE ERASING IS EASIER	TAKES LONGER TO REFRESH, MAY FLICKER		HIGH COST	
COLOR IS MORE ECONOMIC TO IMPLEMENT	COLOR IS DIFFICULT AND EXPENSIVE TO IMPLEMENT	NO COLOR CAPABILITY (MONOCHROME)	NO COLOR CAPABILITY (MONOCHROME)	

TOP LINE DESCRIBES TYPE OF DISPLAY

- COLUMNS PROVIDE SOME INFORMATION FOR EACH TYPE

  - Touch entry.

  - Tablet.

  - Video digitizers.

  - Menus on tablets, buttons or displays.

- Menus on the display screen or on a tablet offer greatest flexibility, particularly for the infrequent user. They can easily be changed through programming and aid a user by encouraging him to make decisions about input.

- Menus on the display screen could provide the easiest method for business users to employ for choosing graphical techniques, colors, data sources, etc.

- Menus are facilitated by on-site graphical processors, which can also be used to merge internal and external data.

- Additional input techniques such as video cameras and voice commands may be utilized in the future.

3. HARDCOPY OUTPUT DEVICES

- Printers, plotters and other hardcopy output devices on the market are listed below, together with some of the business uses for which they are suited.

  - Daisy wheel - management reports (limited volume, ad hoc needs).

  - Impact matrix - management and operational reports of moderate volume.

  - Inkjet - quality printed reports.

  - Electrostatic - voluminous administrative reports.

- Pen plotter - high-quality, low-volume production of management graphics.

- Thermal - low-volume ad hoc reports.

- Photographic - marketing, sales and management presentations.

- Xerox - publications.

- Laser - voluminous administrative reports.

- Color is becoming a requirement for output in many computer business graphics applications. Hardcopy output of color has been limited and expensive. High-speed, high-resolution and faithful color rendition at a reasonable cost is needed.

- New color output devices that have been announced recently are:

- IBM 3287 Color Printer	Peripheral to the 3279, requires support from 370 or 4,300 computer and resident software package; ouput on white paper.
- Trilog and Xerox 6500	Connects to color CRT; ouput on white paper.
- Gunn Instrument 631, Matrix Corp. 2000, 3000, and 4000.	Connects to color CRT; output on Polaroid paper.
- Applicon	Off-line tape unit to inkjet printer.

- The total cost of using these devices (including software) and the quality of output do not appear to meet the needs of potential users as yet.

- An opportunity could exist for an RCS vendor to experiment with new devices on behalf of a group of clients.

E. SOFTWARE

1. INTRODUCTION

- The requirements for computer business graphics software noted by user respondents can be summarized as follows:
  - English language suitable for nontechnical users.
  - The ability to model data in the same ways users think of data.
  - Interactive use and a menu driven display.
  - Rapid response time.
  - Device independent languages developed to meet evolving industry standards.
  - Flexibility to handle tailored formats.
  - Direct linkages between data base management systems and graphics software.

- Future graphics software will generally be menu driven rather than command driven from buttons or keyboards.
  - The user will not have to remember the labels for the keys, buttons and other impact devices he may presently use.

  - The menu driven interfaces will be visually displayed.

  - Query and response interaction will greatly improve the effectiveness of human to machine communications.

- One of the major problems will be providing an interface between graphics software and DBMS to access external data bases.

2. SOURCES OF SOFTWARE

a. How Software Is Supplied

- The sources of systems software for computer business graphics users can be categorized into four general areas, as shown in Exhibit IV-6.

  - The dominant source is ISSCO.

    - Over one half of user respondents use ISSCO software. In addition one half of the RCS vendor software is based on ISSCO products.

  - The large corporate and governmental agencies that have developed their own in-house software also commonly supplement it with independent proprietary packages and RCS vendor supplied packages.

b. Independent Software Vendors

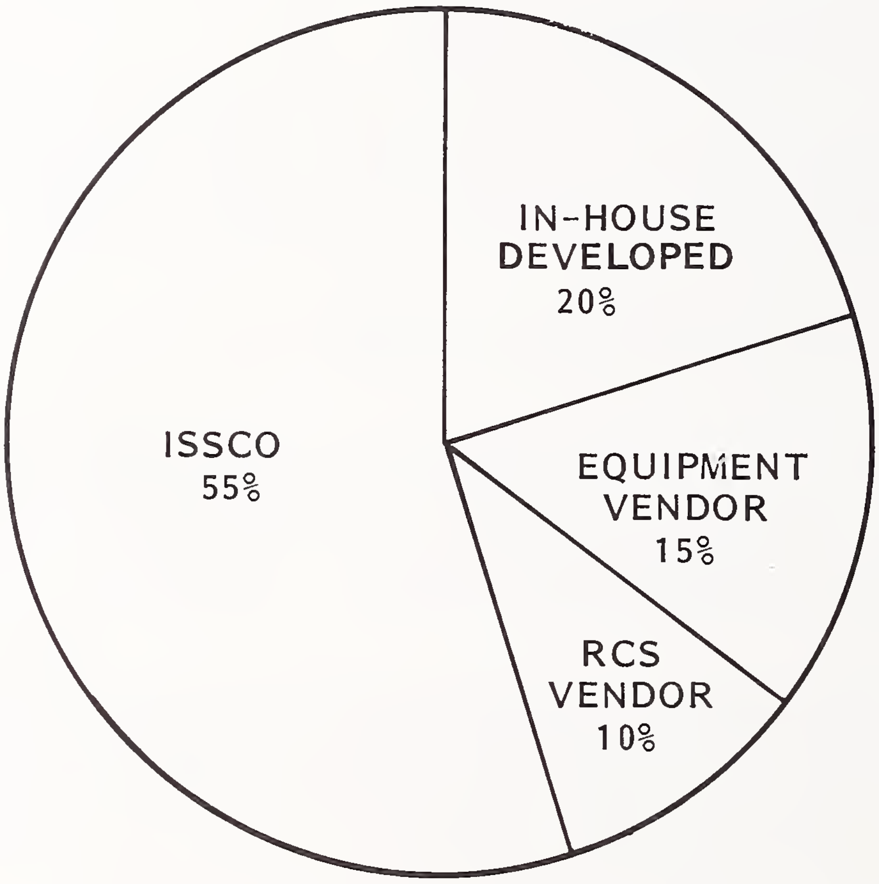
- Among the independent software vendors serving the computer business graphics needs are:

  - ISSCO.

  - SAS Institute, Inc.

EXHIBIT IV-6

SOFTWARE USED FOR BUSINESS GRAPHICS



- Color Pictures.

- Science Applications, Inc.

- Precision Visuals, Inc.

- Harvard Graphics Laboratory.

- ISSCO is by far the dominant vendor, with every third Fortune 100 company reported to be using an ISSCO product. A summary of the current ISSCO users' group is shown in Exhibit IV-7.

  - Although ISSCO users generally speak highly of the company, users also feel that their needs would be better served if there were more competing independent software packages.

- The key ISSCO products are TELLAGRAF and DISSPLA.

  - TELLAGRAF is a conversational computer graphics system which allows a user to employ English language commands. Graphic ouput is created with a minimum of training.

  - DISSPLA is a device independent integrated software system designed to run on minicomputers or large mainframe computers to produce virtually any type of data display.

    - DISSPLA is a system of FORTRAN subroutines which are called by the user's program.

c. Equipment-Vendor-Supplied Software

- Software supplied by interactive display and hardcopy ouput vendors is not generally held in high regard by user respondents. Vendors and their products which were mentioned include:

EXHIBIT IV-7

INTEGRATED SOFTWARE SYSTEMS CORPORATION
(ISSCO)
SUMMARY OF CURRENT USERS' GROUP

INDUSTRY	NUMBER OF USERS OF ISSCO SOFTWARE
MANUFACTURING AND SERVICES	68
BANKING/DIVERSIFIED FINANCIAL/INSURANCE	11
TRANSPORTATION	2
UTILITIES	7
EDUCATION	12
FEDERAL GOVERNMENT	40
STATE GOVERNMENT	3
TIMESHARING VENDORS	23
INTERNATIONAL INSTALLATIONS	42
TOTAL	208

- Tektronix.
    - Easy graphing.
    - Plot 10.
- Hewlett Packard.
    - Decision support.
    - Graphic 3000.
- General Electric Information Systems (GEIS).
    - Genigraphics.
- IBM.
    - Graphic data display manager.
- Xerox.
    - 350 copier system.
- Nicolet Zeta.
    - Z-chart.

- Tektronix and Hewlett Packard are both investing heavily in improving their software packages and are expected by many users to be a major source of business graphics software.

- Users of the GEIS Genigraphics slidemaking system are very enthusiastic about the quality of this product. It offers a means of high-quality output of color graphics that can be used for presentations and photographic reproduction.

d. RCS-Vendor-Supplied Software

- RCS vendors are currently offering computer graphics services based on ISSCO software, or software developed internally or packages supplied under contract.

- A partial list of vendors and their products follows:

  - ISSCO based.
    - National CSS.
    - Sun Information Services.
    - Boeing Computer Services.
    - Computer Sciences Corporation.
    - Informatics.
  - Based on internal proprietary software.
    - Comshare-Execuchart.
    - ADP-TSAM-Econalyst.
    - Rapidata-Graphics.

  - Service Bureau Corporation-Picture PAC.

- Generally, RCS vendors are just starting to use new technology in the computer business graphics market and their efforts should expand.

3. ADEQUACY OF BUSINESS GRAPHICS SOFTWARE

- Both RCS vendor and user respondents rate sofware from computer equipment vendors as little more than adequate.

- It is felt that software has been provided to meet marketing needs, but not to address emerging user needs.

- Tektronix and Hewlett Packard are identified as vendors who recognized user needs and are attempting to improve their software.

- Software vendors, particularly ISSCO, were first to recognize user needs, as noted in Section IV E-2.

- RCS vendor respondents feel that their software packages have now improved to the point where they can compete with software vendors, as shown in Exhibit IV-8.

- ISSCO is the software source most frequently referred to by respondents. Features that they commented upon include:

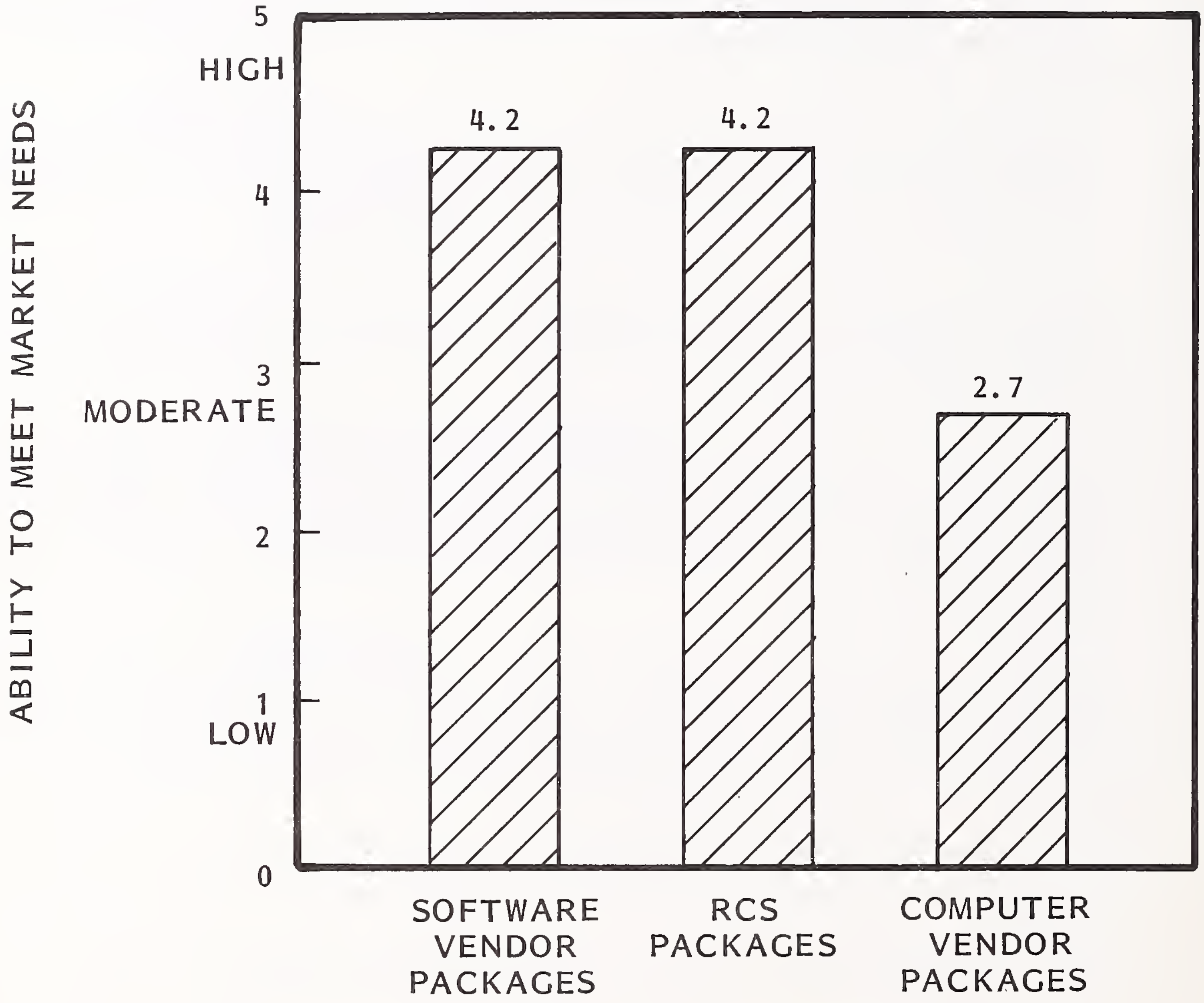
  - English language commands.

  - Device independence.

  - Wide range of graphical capabilities.

EXHIBIT IV-8

AVERAGE RATING OF SOFTWARE
BY RCS VENDORS



- Terminal and input device manufacturers as well as software suppliers stress compatibility with ISSCO software, e.g., an advertisement by Retro-Graphics in the March 20, 1981, issue of Computerworld.

- Earlier software products such as those developed by CalComp and Tektronix (Plot-10 and TCS) are noted by a few respondents.

- There are over 50 firms supplying software for business graphics software, however. It is likely that one or more of these firms will develop products that will address current problems or make substantial improvements.

- An indication of the improvement needed or anticipated by user and vendor respondents is shown in Exhibit IV-9.

- Less than 50% of users feel that graphics software meets their needs fully today, but 75% feel that it will do so in five years.

- An interesting fact emerges from Exhibit IV-9. Vendors also feel that needs cannot be met fully today, but they expect the software will be adequate or superior by 1985. Twenty-five percent of users feel that software will still not meet their needs well in 1985. Perhaps there are unrecognized needs that users have, which RCS vendors should explore.

4. DATA BASES

- User respondents noted that it was more important to access data bases than to be able to generate graphics or tailor the graphics to meet specific user requirements.

- As shown in Exhibit IV-10, users feel that data base access is a major requirement and will become even more important by 1985.

EXHIBIT IV-9

EVALUATION OF GRAPHICS SOFTWARE

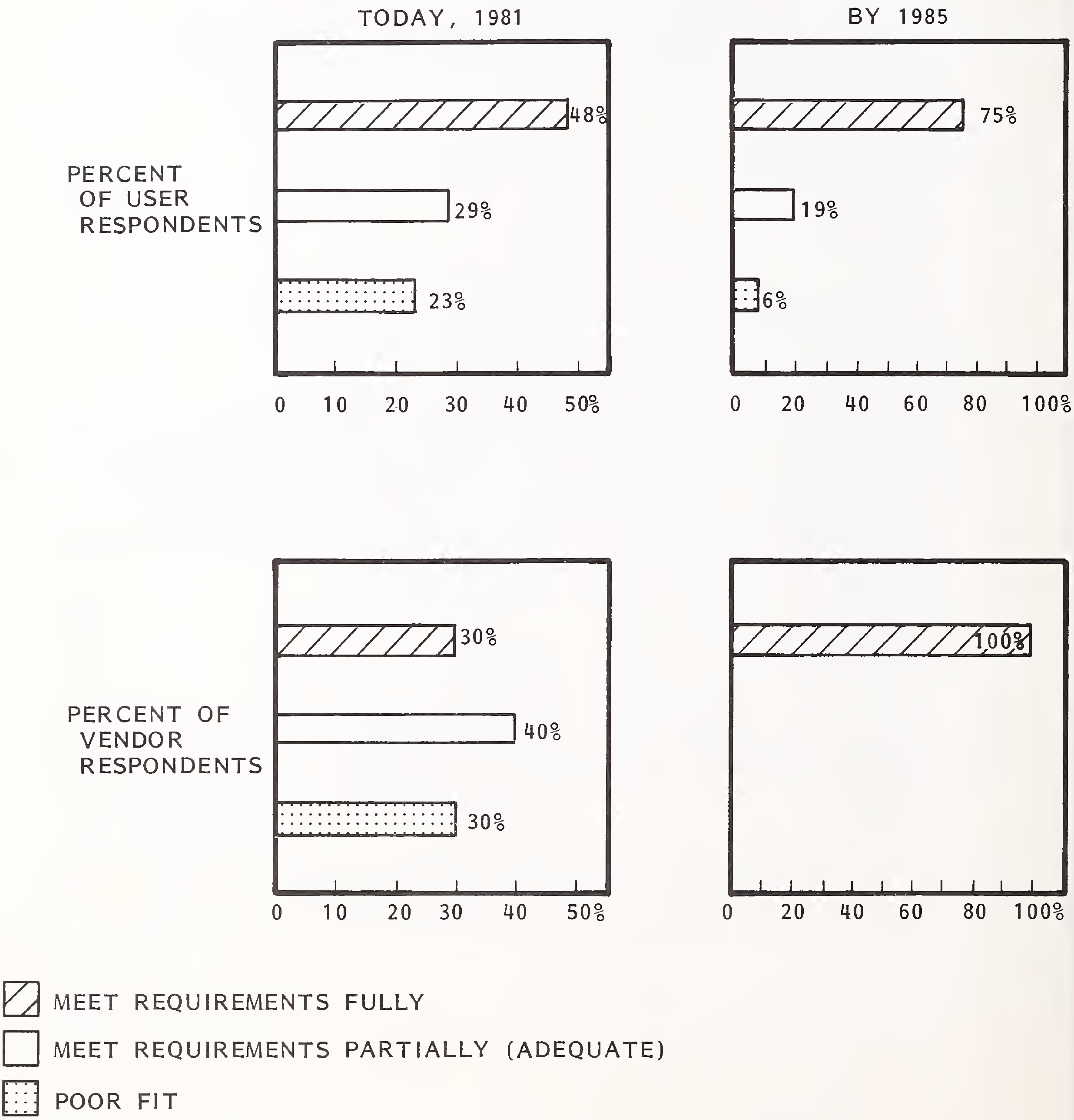
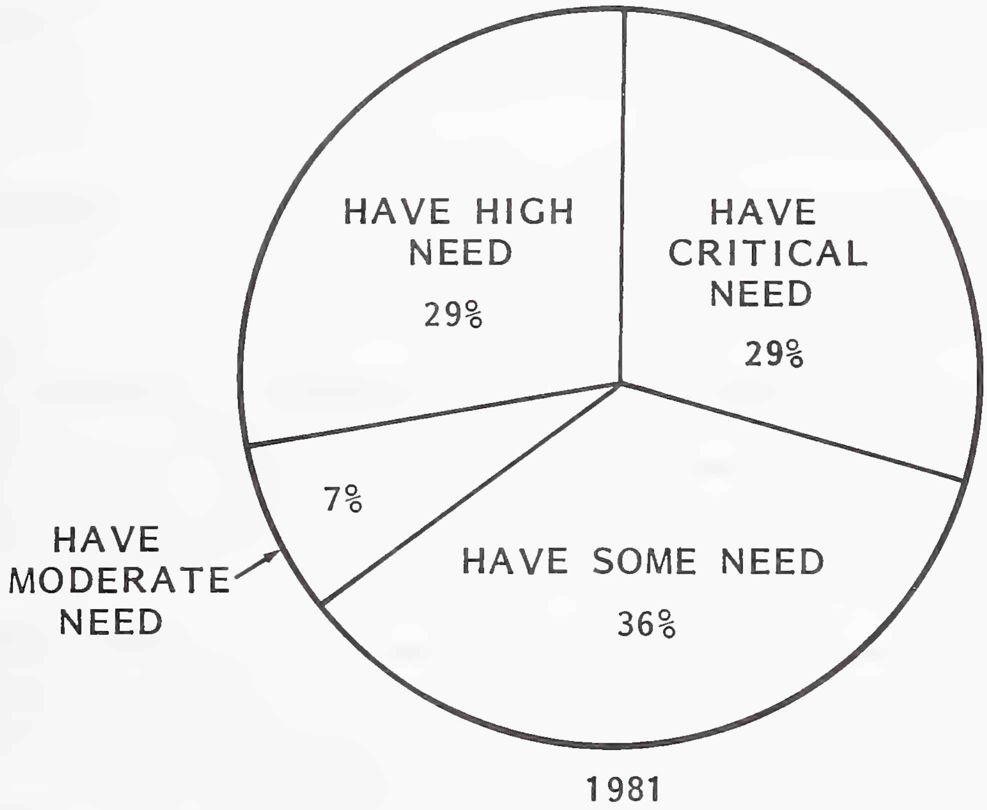
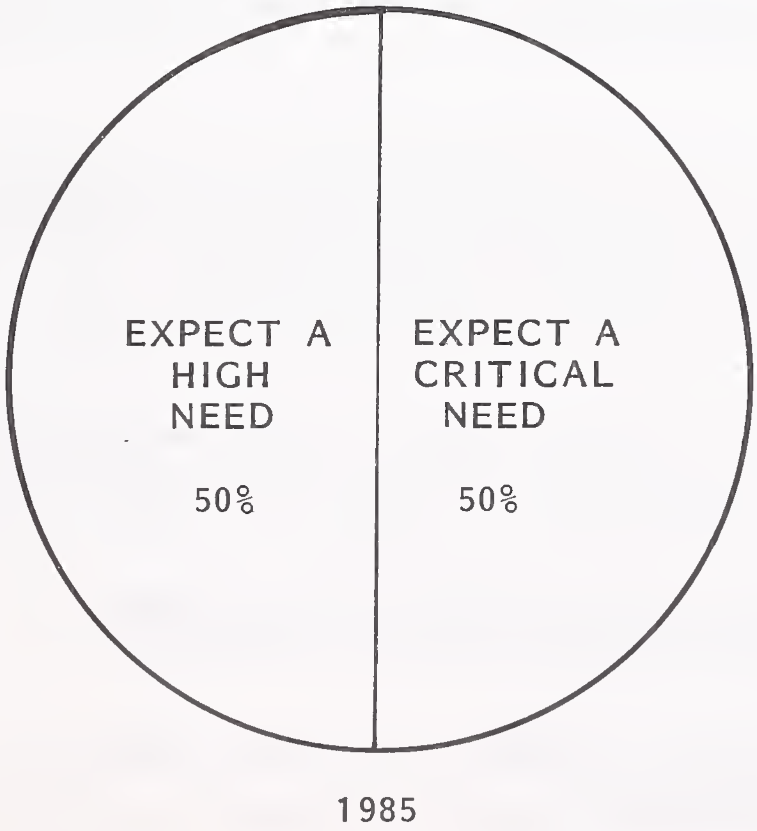


EXHIBIT IV-10

REQUIREMENT TO USE DBMS





PERCENT OF RESPONDENTS

- Users noted that current needs are focused on in-house data bases. A breakdown of the types of data employed in user areas today is shown in Exhibit IV-11.

- User respondents were more interested, in general, in displaying or picturing the internal data (listed in Exhibit IV-11) than in relating it to external data. Sixty-seven percent of respondents felt that the inclusion of external data would not presently be important.

- This reflects the developing use of business graphics as an extension to in-house data processing output capabilities.

- All user respondents indicated that a major requirement by 1985 would be to utilize external data bases. Several user respondents noted that they would be used in relation to internal data to compare, explain or forecast results.

- Some of the user respondents noted that they were not sure what external data sources would be used or how internal and external data should be combined, although they knew management expected it to be done.

- RCS vendors may be able to provided consulting aid together with data base capabilities.

- Respondents also noted that they expected RCS vendors to play a significant role in providing access to external DBMS. Fifty percent of the user respondents to this study rate this issue of importance.

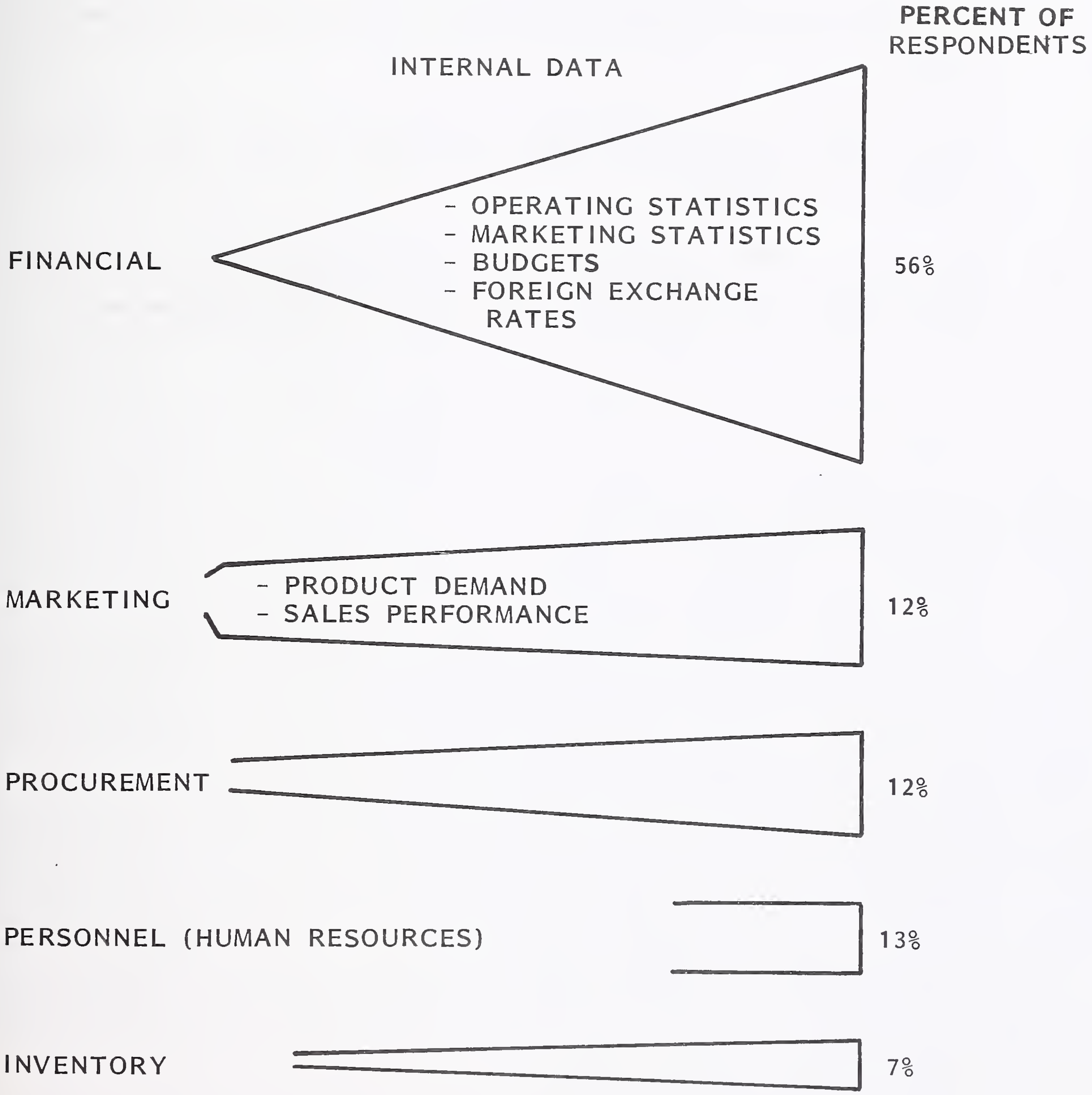
- The ownership of external DMBS and the development of software that will interface to it will provide an entree to the graphics market.

5. GRAPHICS STANDARDS PLANNING COMMITTEE

- In planning software strategies, RCS vendors should also consider the work of the Graphics Standards Planning Committee of the SIGGRAPH group of the ACM and the growing need to use external data bases.

EXHIBIT IV-11

DATA USED IN GRAPHICS APPLICATIONS



- The ACM committee has developed a system package, GFPC CORE, that was accepted as an ANSI standard in 1980. It standardizes the structure of the graphics language in relation to medium performance, vector interactive graphics displays.

- The CORE package addresses text as well as moving images and sections of a display.

- CORE will be expanded to address raster displays, color, hidden lines and surfaces and data bases.

- Observing the CORE standards will result in more independence from devices and software. It may also provide access to a wider body of programmers.

V BUSINESS GRAPHICS MARKET

V BUSINESS GRAPHICS MARKET

A. CURRENT ACTIVITY

- Business management seems only recently to have become aware of computer graphics.

  - Part of the interest may stem from its use by the government to explain economic and international situations.

  - Viewers can see how effective graphics techniques and the use of color can be to portray complex relationships between data.

  - National magazines and periodicals employ graphical data to demonstrate facts as well.

  - Personal computers use graphical techniques and color in demonstrations and games that suggest to viewers how effective these techniques can be to communicate ideas.

- IBM, Hewlett Packard, Xerox and other firms have noted the growing interest in business graphics and have increased their product offerings and advertising.

  - Of significance is the fact that IBM has introduced an interactive business graphics terminal and color hardcopy device.

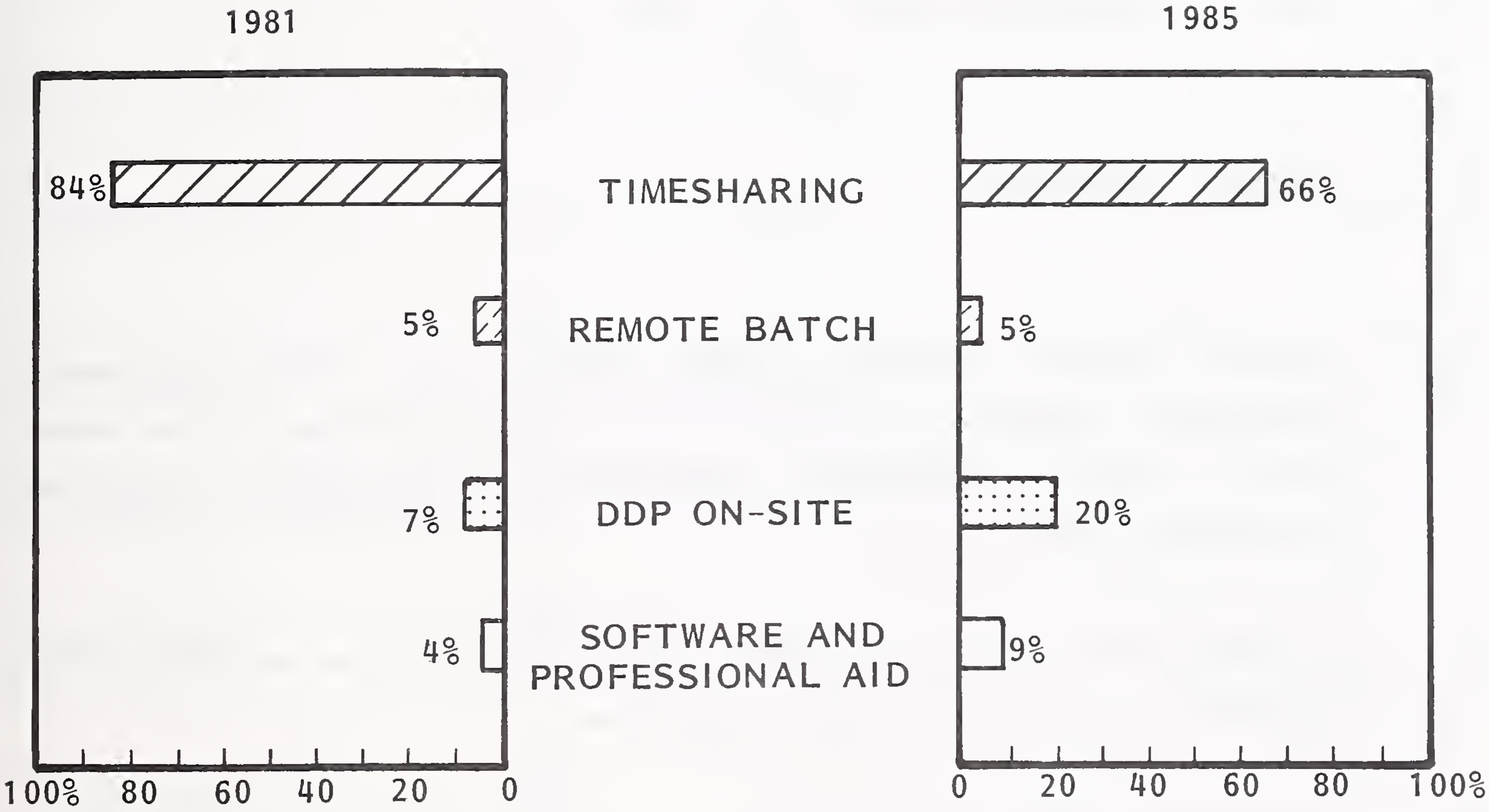
- Executives have noted that graphics, and particularly the use of color, can make complex relationships easier to understand, compare and discuss.
    - If this saves a small amount of time in executive presentations or reviews it will result in a considerable payoff.
    - If graphics leads to better decision-making, the payoff warrants a large investment.
- A status type of appeal is already evident in the use of color graphics. It signifies the use of technology by a business organization.
- The use of business graphics has been associated with analyses of productivity.
- In addition to the foregoing factors, the cost of graphics equipment, particularly of color displays, has decreased sharply.
- The demand for business graphics coupled with the need to interface graphics software and internal and external data bases has created an opportunity for RCS vendors.
- RCS vendors can be expected to change the methods they have been using to serve the business graphics market as they react to customer demands.
- In addition to providing the capabilities outlined in Section IV, RCS vendors will change the mode of delivering services to meet customer demands.

B. RCS VENDORS - MODE OF DELIVERY

- Vendor respondents expect the mode of delivery for business graphics to change by 1985, as shown in Exhibit V-1.

EXHIBIT V-1

PERCENT OF BUSINESS GRAPHICS REVENUE BY DELIVERY METHOD



- The use of on-site hardware is expected to generate 20% of revenues by 1985.

- The on-site computer will provide the capability of a graphics processor serving menu driven, interactive workstations, as described Section IV.

- The use of these processors could be greater than projected. One RCS respondent, responsible for planning, thought that they would generate 50% of business graphics revenue by 1985.

- It should be noted that timesharing capabilities are still expected to generate considerable business graphics income, however. The ability to use some type of business graphics software and access external data bases from a terminal, in itself, is expected to satisfy many business users.

C. MARKET FORECAST

- Computer business graphics has been used for some time in financial, operational, management science and statistical applications, but the recent interest of business management creates the impression that a totally new business market has emerged.

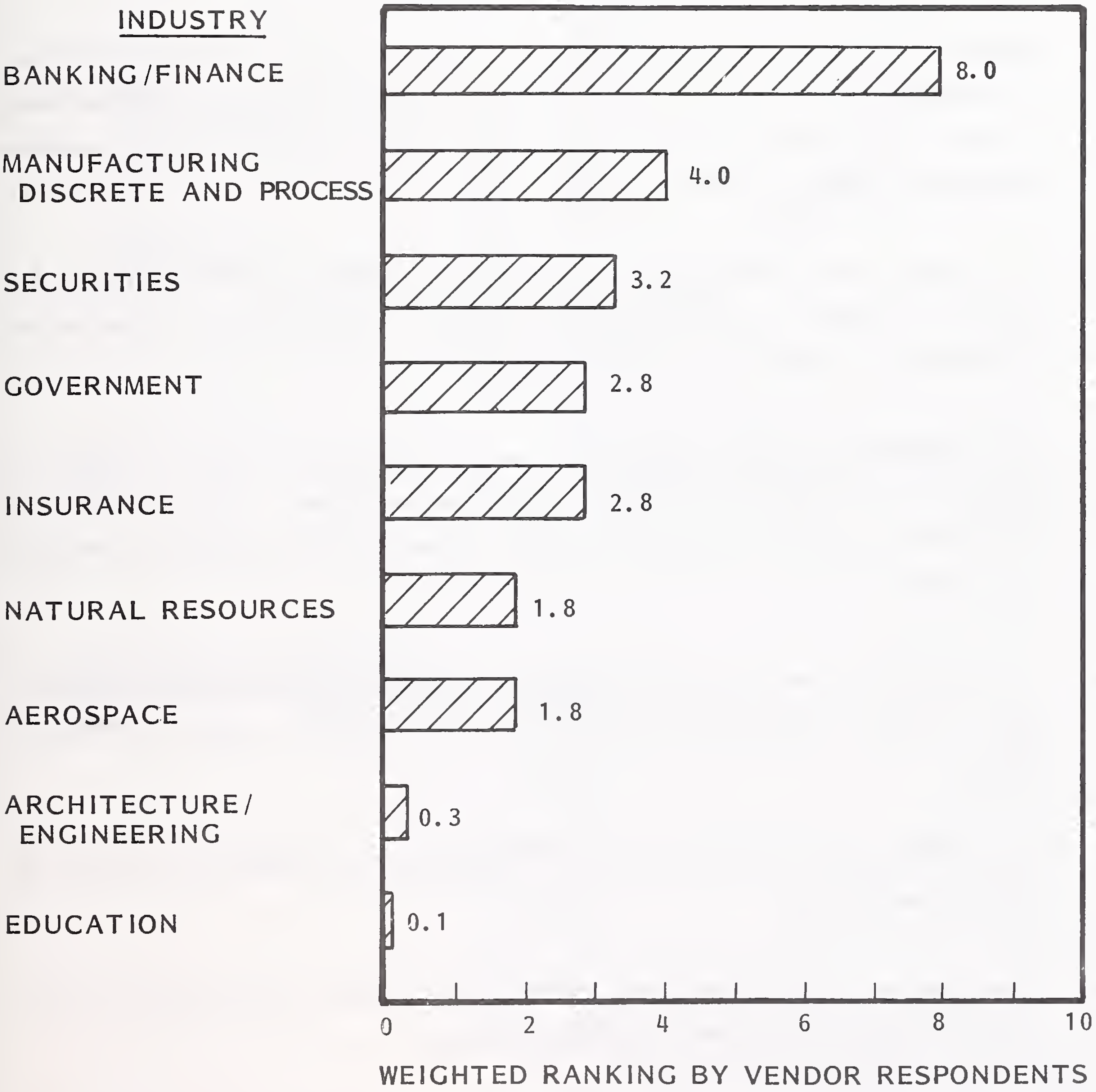
- Of course, this market has been made possible by the reduced cost of equipment and improved software capabilities.

- Vendor respondents, in general, commented that they have been in this market for many years, but feel as though the market has just started.

- Vendor respondents ranked the industries having the highest market potential for the sale of business graphics services and software from a selected list. Results are shown in Exhibit V-2.

EXHIBIT V-2

MARKET POTENTIAL FOR BUSINESS GRAPHICS



WEIGHT = RELATIVE RANKING X THE NUMBER OF FIRST PLACE RANKINGS BY RESPONDENTS.

- An estimate of the growth of the business graphics market between 1980 and 1985 has been made by a number of industry sources. Estimates generally are in the range of 50% to 60%.

- The introduction of new graphics techniques, software and the use of color caused an average annual growth rate in the graphics market of 48% between 1976 and 1980. Business applications did not participate in this growth.

- Business management has just become aware of the potential of the new techniques, hardware and software. Consequently, the growth in the business market for graphics could resemble the growth found in other graphics applications between 1976 and 1980.

- The expectations of RCS vendor respondents correlates with the forecasts for growth in business graphics by industry sources. The growth rate expected by respondents through 1985 averages to 44%.

- The short-term growth forecast by some respondents, which is based on contracts or ongoing work with customers, is higher. Forty percent of respondents expect the growth rate during the next year to be between 65% and 100%.

- A forecast for revenue from business graphics applications is shown in Exhibit V-3 for vendor respondents in total and the RCS industry, using the AAGR of 44%.

- The figure of $2.5 million used as a 1980 base was the aggregate reported by vendor respondents.

- The base of $125 million used for the RCS industry was prepared from a review of reported income and industry sources.

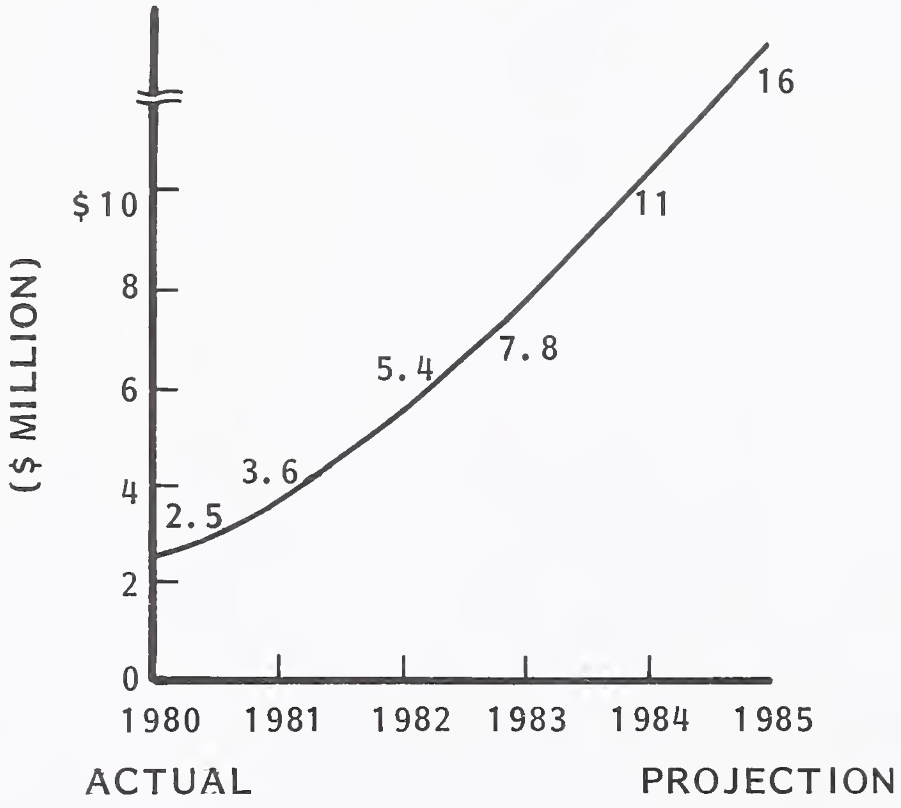
- Shortages of trained personnel, delays in developing low-cost color output equipment, unrecognized quality or maintenance problems, other unique

EXHIBIT V-3

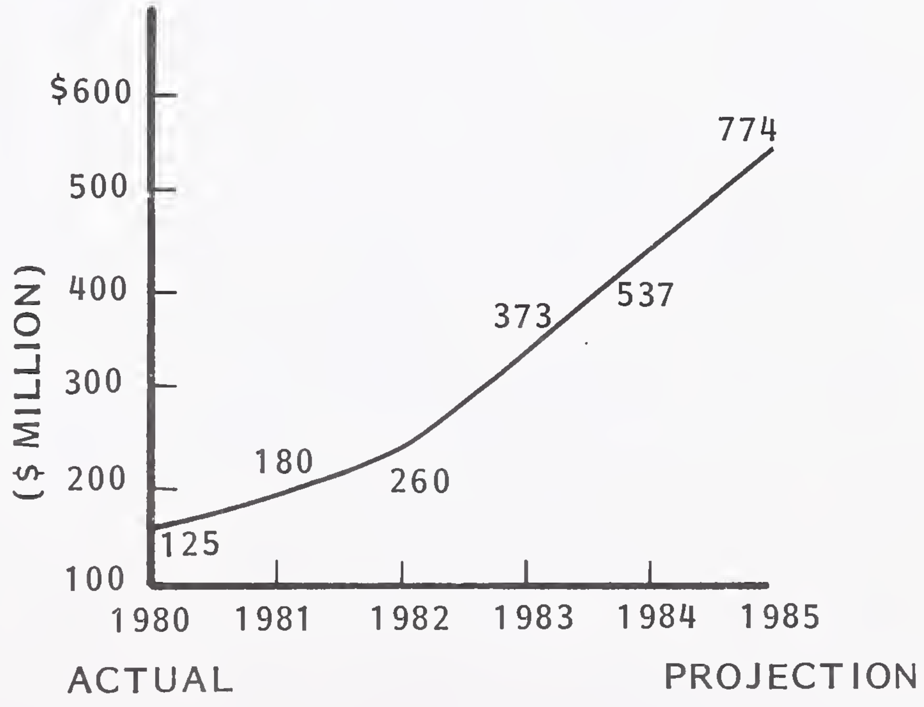
FORECASTS OF COMPUTER BUSINESS GRAPHICS INCOME

VENDOR RESPONDENT PROJECTIONS

(BASED ON 44% AAGR)



INDUSTRY PROJECTION BASED ON RESPONDENTS' AAGR



factors of this industry and the national economy, of course, could impact this growth rate. These factors could reduce business or place more reliance on RCS vendors than an expenditure for in-house expertise.

VI COMPETITIVE ENVIRONMENT

VI COMPETITIVE ENVIRONMENT

A. PRESENT AND FUTURE COMPETITION

- The market for computer business graphics is highly competitive for equipment vendors. This is not presently true for software and RCS vendors.

- An evaluation of the competition being encountered and expected by vendor respondent is shown in Exhibit VI-1.

    - Half the vendor respondents rate the present competition as low. This may be due to the following:

        - Service has not caught up to the demand by business.

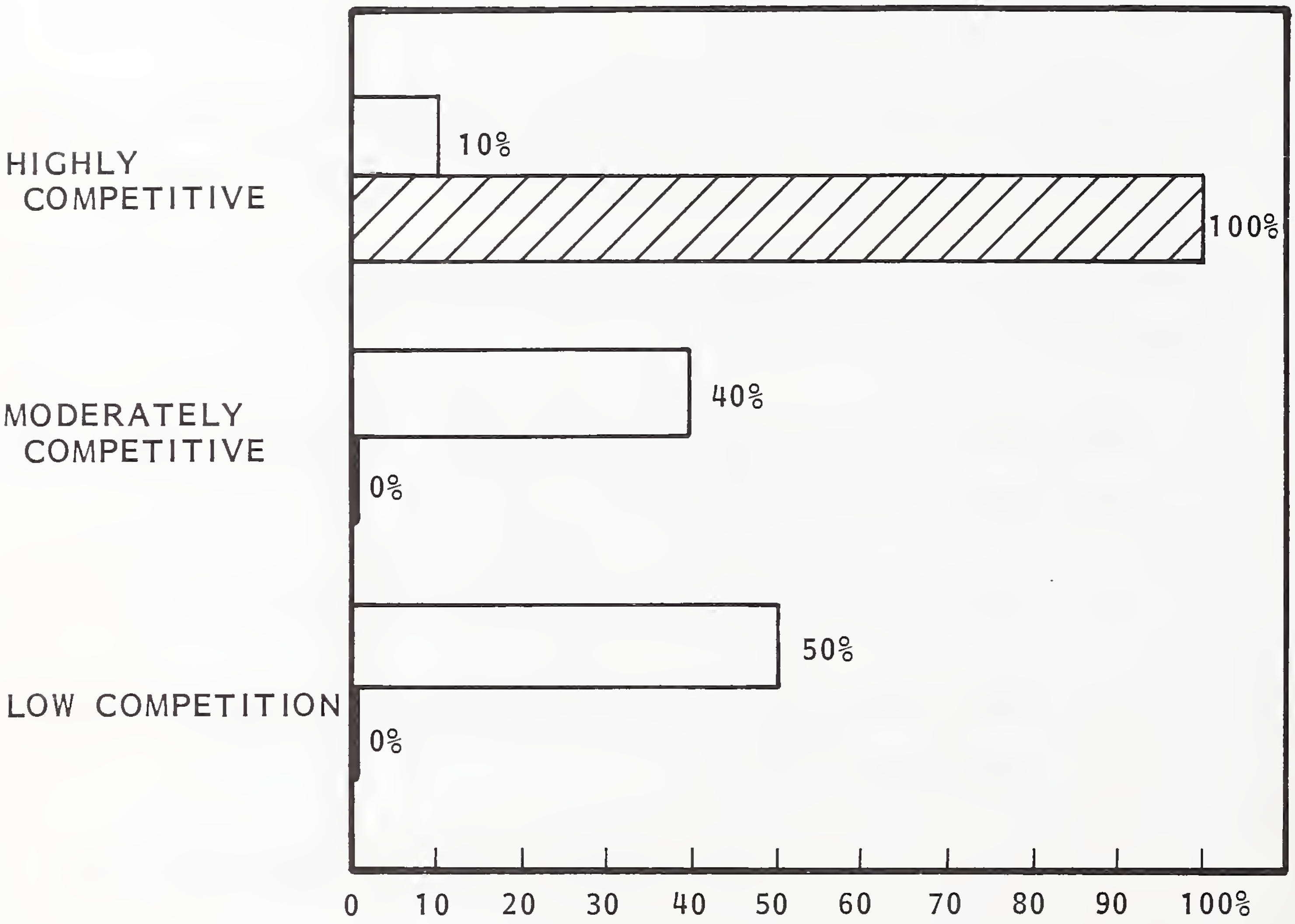
        - RCS vendors do not directly compete with the terminal, digitizer and plotter suppliers.

    - The vendors all expect the market to be highly competitive by 1985.

        - By then, it is expected that on-site graphics processors with interactive workstations and the use of external data bases will be established.

EXHIBIT VI-1

COMPETITION PERCEIVED BY RCS VENDORS



☐ PERCEPTION IN 1980

▨ EXPECTED IN 1985

- Although respondents expect the greatest degree of competition to come from other RCS vendors, competition is also expected to come from in-house and turnkey systems, as shown in Exhibit VI-2.

- EDP managers are expected to rely on external data bases and specialized graphics capabilities which will provide an opportunity for RCS vendors.

- There are also special problems relating to computer business graphics including:

    - A lack of knowledge of the variety of techniques available to portray data.

    - The dangers of using techniques that might suggest erroneous conclusions.

    - A lack of programming capability that might be needed to customize results or interface graphics software and external or internal data bases.

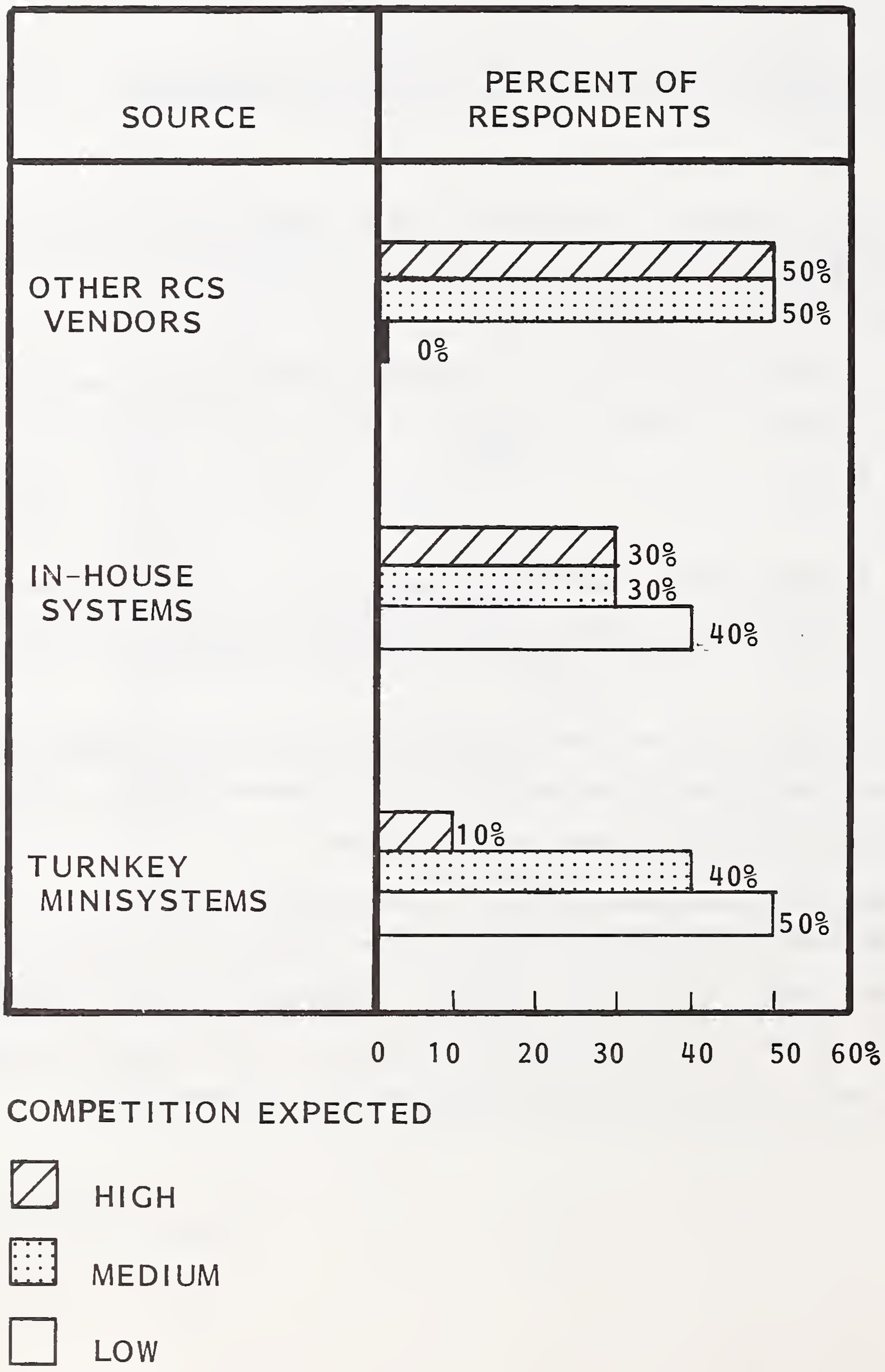
    - Problems that can be encountered in maintaining quality or unique considerations in the upkeep of graphics equipment and software.

- RCS vendors, who acquire experience from serving many customers, can address these problems better than most in-house users and provide continuing aid more economically than turnkey vendors.

- Competition from turnkey vendors is also expected to be low in general, due to the fact that a large sum, typically $300,000 to over $1,000,000, must be justified at one time in buying their systems. RCS vendors can allow clients to experiment with and start using graphics on a low-cost basis.

EXHIBIT VI-2

SOURCE OF EXPECTED COMPETITION



B. VENDOR RECOGNITION

- User and vendor respondents were asked to identify and rate vendors of business graphics equipment and services. The results obtained from users are shown in Exhibit VI-3.

- Respondents could identify and rate vendors of equipment, software and consulting services, but they could identify few RCS vendors and did not feel that they knew enough to rate them.

- Vendor respondents displayed the same pattern of answers. They could identify and rate vendors in all areas but RCS services in which just a few competitors were known.

- This supports the contention that RCS vendors are not that active yet in the new types of business graphics, and that competition between them has not developed to any extent.

C. PRODUCT MARKETING

- Vendor representatives were asked whether business graphics was being sold as a standalone product or as part of a data base or other offering. Results indicated that business graphics is generally integrated with the offering of data base capabilities or other products (e.g., financial modeling packages).

- Although business graphics may aid the marketing of other products, this does not appear to be the best strategy in all cases. Users in general are looking for aid in the use of business graphics and a supplier who can address many elements of the business graphics problem.

EXHIBIT VI-3

RECOGNITION OF VENDORS BY USER RESPONDENTS

SERVICE/PRODUCT	VENDOR	WEIGHTED RANKING
DISPLAYS	TEKTRONIX	36
	HEWLETT PACKARD	20
	IBM	19
	CHROMATICS	0
PLOTTERS	HEWLETT PACKARD	24
	CALCOMP	23
	TEKTRONIX	15
	XEROX	14
	NICOLET ZETA	12
SOFTWARE	ISSCO	46
	SAS	6
	TEKTRONIX	6
RCS	NCSS	0
	TYMSHARE	0
	COMSHARE	0
	NCSS	0
CONSULTANTS	AUI DATA	15
	MACHOVER	15
	HARVARD GRAPHICS LAB	6

WEIGHTING = NUMBER OF MENTIONS BY RESPONDENTS X THE AVERAGE RANKING (1 = LOW TO 5 = HIGH) WHICH RESPONDENTS GAVE VENDORS.

- Since RCS vendors are accumulating application experience and hardware and software knowledge relevant to business graphics, they could use this background to gain entry to firms interested in business graphics.

- RCS vendors should screen their targets and spend most attention on firms that are able to use their proprietary data bases in the future, since that would provide a reason for continuing service.

- RCS vendors could also use their knowledge of business graphics and its unique needs and problems, which were discussed in Section VI-B, as a justification for a continuing consulting arrangement and/or provision of remote services.

- Business graphics is now being used as a means of advertising other product capabilities for several RCS vendors.

APPENDIX A: DESCRIPTION OF RESPONDENTS

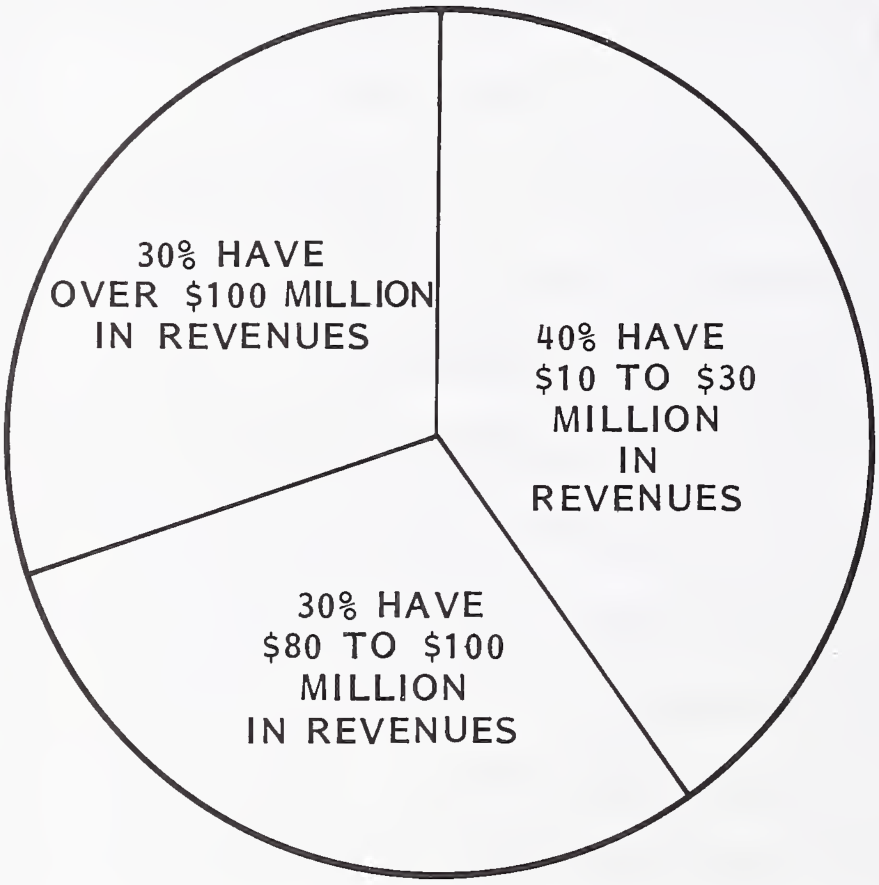
EXHIBIT A-1

INDUSTRY BREAKDOWN OF BUSINESS GRAPHICS USERS SURVEYED

INDUSTRY
PROCESS MANUFACTURING
FEDERAL GOVERNMENT
DISCRETE MANUFACTURING
BANKING AND FINANCE
EDUCATION
INSURANCE
STATE GOVERNMENT
TRANSPORTATION

EXHIBIT A-2

PROFILE OF RCS VENDOR RESPONDENTS



AVERAGE RCS REVENUE = $77 MILLION

APPENDIX B: RELATED INPUT REPORTS

EXHIBIT B-1

RELATED INPUT REPORTS

- MARKET OPPORTUNITIES FOR DATA BASE SERVICES - JULY, 1980
- TRENDS IN DELIVERY OF REMOTE COMPUTING SERVICES - NOVEMBER, 1980

APPENDIX C: QUESTIONNAIRES

CATALOG NO. MOBG

OPPORTUNITIES FOR BUSINESS GRAPHICS SERVICES AND SOFTWARE

Definition of Business Graphics:

- Graphic representation of data used for management purposes or activities, based on on-line data bases, internal or external.
- Business graphics systems have the ability to draw, on-line, data contained in a data base and display the data graphically in the form of images, pictures, or charts.
- Emphasis:
  - The impact of software and on-line data bases.

1. For what purpose are you using business graphics now, and what future applications are you planning?
(If user cannot respond, thank you and terminate the interview)

(✓) check

APPLICATION	1981	1985
SENIOR MANAGEMENT REPORTING		
FINANCIAL AND OPERATIONAL ANALYSES		
PROJECT MANAGEMENT		
OPERATIONAL MANAGEMENT		
PLANNING AND FORECASTING		
MARKETING OR SALES MANAGEMENT OR PRESENTATIONS		
OTHER ______		
OTHER ______		
OTHER ______		

Please describe: ______________________

____

____

____

CATALOG NO. M O B G ☐ ☐ ☐

2. Who are the direct end users (terminal operators) of your business graphics system, by job title:

____

____

____

____

Comments: ____

____

____

____

3. How long has your company been using business graphics?

____ Years

4. Would you use business graphics for more applications if more resources were available?

RESOURCE	YES	NO	APPLICATION
SOFTWARE			
DATA BASE			
EQUIPMENT			
COMMUNICATIONS LINK			
OTHER ____________			
OTHER ____________			

Please comment: ____

____

____

____

____

5. By which of the following methods, or combination thereof, are your business graphics provided?

METHOD(S)	VENDOR(S)
Standalone minicomputer systems	______
In-house mainframe systems	______
Remote computing services systems/ timesharing	______
Distributed data processing	______
Personal or very small (< $15,000) computer	______
Other	______

Comments: ______

______

______

______

6. Are you familiar with other companies that are current users of business graphics?

COMPANY	LOCATION	CONTACT
______	______	______
______	______	______
______	______	______
______	______	______

7. How much is your company spending on business graphics now, and what do you expect it to be in 1985?

		1981	1985	
a.	Expenditures per month	_____	_____	$/mo in thousands
	or			
	Capital expenditures per year	_____	_____	$/yr in thousands
b.	Expected rate of increase in expenditures		_____	% A.A.G.R.

8. Please rate the importance of price and performance of business graphics systems. Rate on a scale of 1 to 5, where 1 is unimportant and 5 is of critical importance.

_____ Price rating

_____ Performance rating

Comments: ____

____

____

9. What are your perceptions of the major benefits of business graphics systems, now and in 1985. Please rate on a scale of 1 to 5, where 1 is not attributable to the system at all and 5 is an extremely important benefit of the system.

BENEFIT	1981 RATING	1985 RATING
• Increased capability to communicate	_____	_____
• Savings by reduction of paperwork	_____	_____
• Increased productivity	_____	_____
• Improved management decisions	_____	_____
• Improved comprehension of business alternatives	_____	_____
• Reduced manual analysis	_____	_____
• Other _______________	_____	_____
• Other _______________	_____	_____

Comments: ____

____

10. As a user of business graphics systems, please rate your requirements for the following systems characteristics. (Please rate on a scale of 1 to 5, where 1 is not needed at all and 5 is absolutely vital)

FEATURE	RATING
Color	_______
Resolution	_______
Response time	_______
System flexibility	_______
Interactive use	_______
Hardcopy output	_______
Micrographics output	_______
Other ____________________	_______
Other ____________________	_______

Comments: ____

____

____

11a. To what extent are business graphics systems used interactively, now and in 1985. Please rate on a scale of 1 to 5, where 1 is not at all and 5 is extensively.

1980	1985
_____ Rating	_____ Rating

b. How important is the interactive capability of present business graphics systems. Please rate, 1 is completely inadequate and 5 is superior.

_____ Rating

Comments: ____

____

____

____

12. How are the computer equipment requirements for your business graphics system met.

EQUIPMENT	EQUIPMENT / SERVICES VENDOR	MODEL
WORKSTATION		
INPUT/DISPLAY		
CPU/MEMORY		
Communications link (to remote data base) Hardcopy output		
MICROGRAPHICS OUTPUT		
OTHER__________		
OTHER__________		

13. How adequate are personal or very small computers ($15,000) for your business graphics need. Please rate, 1 is completely out of the question and 5 is completely adequate.

_____ Rating

Comments: ____

____

____

____

14. How is the software supplied for your business graphics system, how important are these sources to you (rate), and how adequate is the present software (rate)?

SOURCE	PRESENT SUPPLIER	RATE - 1 to 5	
		Importance	Adequacy
INDEPENDENT PROPRIETARY PACKAGES			
COMPUTER EQUIPMENT VENDOR SUPPLIED PACKAGES			
IN-HOUSE SOFTWARE			
COMPUTER SERVICES VENDOR SUPPLIED PACKAGES			
OTHER ____________________			

Comments: ____

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15. What proprietary software packages do you use (listing) and how adequate are they for your needs (rating 1 to 5)

- ______________________ ______ rating
- ______________________ ______ rating
- ______________________ ______ rating
- ______________________ ______ rating

16. Please rate, on a scale of 1 to 5, the importance and present adequacy of the following types of software.

SOFTWARE REQUIREMENTS	RATING	
	Importance	Adequacy
OPERATING SOFTWARE TO GENERATE GRAPHICS		
APPLICATIONS SOFTWARE TAILORED TO USER REQUIREMENTS		
COMMUNICATIONS CONTROL SOFTWARE TO ACCESS DATA BASE		

Comments: ______________________

____

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____

17. How adequately do you feel that your software requirements are being met now and in 1985. Please rate.

1981 1985

_____ rating _____ rating

Comments: ____

____

____

18. How important are current and projected data base activities for business graphics. Please rate.

1981 1985

_____ rating _____ rating

19. Please rate the importance of internal and external data bases for business graphics.

	Rating
• Internal	_____
• External	_____
• Internal and external both	_____

20. What are the most important contents of data bases on which your business graphics system(s) are based?

____

____

____

21. What would you say the most popular data bases in your field are today and what do you see them being in the future?

1981	1985
_____	_____
_____	_____
_____	_____

22. Who do you feel are the present leading vendors serving the needs of business graphics users. Please rank in order of ability to serve your needs, and rate (1 to 5) present and future adequacy of the vendors as a group to meet present and future needs of business graphics users.

VENDORS RATING (1 to 5)

- Equipment-Input/output displays

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

- Equipment-plotters

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

- Equipment-CPUs/memory

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

- Independent software vendors

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

- Remote computing services vendors

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

- Professional consulting services vendors

1. ______________________ ____
2. ______________________ ____
3. ______________________ ____

23. To sum up, how would you describe the characteristics of successful business graphics systems today,

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and how will they be different in 1985.

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CATALOG NO. MOBG☐☐☐

OPPORTUNITIES FOR BUSINESS GRAPHICS SERVICES AND SOFTWARE

DEFINITION OF BUSINESS GRAPHICS:

- Graphic representation of data used for management purposes or activities based on on-line data bases, internal or external.
    - Business graphics systems have the ability to draw, on-line, data contained in a data base and display the data graphically in the form of images, pictures, or charts.

1. By what methods are you currently offering business graphics services and software to end users, as measured by percentage of revenues generated, and what do you expect the breakdown to be in 1985.

METHOD	1980	1985
• Remote computing services - timesharing	_____%	_____%
• Service bureau operations	_____%	_____%
• Distributed data processing	_____%	_____%
• Software products	_____%	_____%
• Professional services	_____%	_____%
• Other ____________________	_____%	_____%
TOTAL	100%	100%

Comments: ____

____

____

2. How long have such services been offered?

_____ Months

3. What were, or are expected, total corporate annual revenues derived from business graphics services.

$ ________ 1980

$ ________ 1981

$ ________ 1985

Comments: ____

____

____

4. What are the major applications for business graphics today and in 1985. Please rate on a scale of 1 to 5, where 1 is very little used and 5 is heavily used.

APPLICATION	RATING	
	1981	1985
SENIOR MANAGEMENT REPORTING		
FINANCIAL AND OPERATIONAL ANALYSES		
PROJECT MANAGEMENT		
OPERATIONAL MANAGEMENT		
PLANNING AND FORECASTING		
MARKETING OR SALES MANAGEMENT OR PRESENTATIONS		
OTHER ____________		
OTHER ____________		
OTHER ____________		

Comments: ____

____

____

5. What industries have the highest market potential for sale of business graphics services and software. Please rank in order of market potential, now and in 1985.

INDUSTRY	RANKING	
	1980	1985
BANKING AND FINANCE		
INSURANCE		
SECURITIES		
A & E/CONSTRUCTION		
DISCRETE - MANUFACTURING		
PROCESS - MANUFACTURING		
AEROSPACE		
NATURAL RESOURCES		
GOVERNMENT AGENCIES		
EDUCATION		
OTHER ______________		
OTHER ______________		

6. Who are typical end users (terminal operators) of business graphics services, by job classification.

____

____

____

____

7.a. Please describe a typical business graphics services installation:

____

____

____

____

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____

b. Do you see a role for the personal computer in business graphics services?

____

____

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____

8. Please identify other users and providers of business graphics services and software.

____

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9. To what extent do you feel that business graphics are a product in itself as opposed to a product differentiator?

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10. How competitive do you feel the business graphics market is, today and in 1985. Please rate on a scale of 1 to 5, where 1 is "a sellers market," and 5 is fiercely competitive.

	1981	1985
Rating	______	______

Comments: ____

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____

11. Please rate the strongest competition for the business graphics market.

Turnkey minicomputer systems _____ rating

In-house mainframe systems _____ rating

Other remote computing services systems/timesharing _____ rating

Other ______________________________ _____ rating

Who are the foremost competitors? ____________________________________

____

____

____

Comments: ____

____

____

____

12. What is the source of your business graphics software and how do you rate its adequacy. Rate on a scale of 1 to 5 where 1 is inadequate and 5 is superior.

(X) Source of Software/Vendor	Package	Rating
☐ Independent Proprietary Packages		____
☐ ISSCO	DISSPLA	____
	TELLAGRAF	____
☐ ____________	________	____
☐ ____________	________	____
☐ Computer Equipment Vendor Supplied Packages		
☐ TEKTRONIX	Easy Graphing, Plot - 10	____
☐ HEWLETT-PACKARD	Decision Support Graphic 3000	____
☐ IBM	________	____
☐ ____________	________	____
☐ ____________	________	____
☐ Computer Services Vendor Supplied Packages		
☐ ____________	________	____
☐ ____________	________	____
☐ ____________	________	____
☐ In-House Software	________	____
☐ ____________	________	____
☐ ____________	________	____
☐ ____________	________	____

Comments: ____

____

____

13. Please rate on a scale of 1 to 5, the importance and adequacy of the following types of software.

SOFTWARE REQUIREMENTS	RATING	
	Importance	Adequacy
OPERATING SOFTWARE TO GENERATE GRAPHICS		
APPLICATIONS SOFTWARE TAILORED TO USER REQUIREMENTS		
COMMUNICATIONS CONTROL SOFTWARE TO ACCESS DATA BASE		

14. How adequately do you feel the overall software requirements are being met now and in 1985? Please rate.

1981 ______ rating 1985 ______ rating

15. How important do you feel it is for services companies to develop direct linkages between database management systems and graphics software. Please rate on a scale of 1 to 5, where 1 is non-essential and 5 is of critical importance.

______ Rating

16. Please describe your current and planned future database management systems activities related to business graphics. Include internal and external databases.

Present: ______________________________

Future: ______________________________

17. As a supplier of business graphics services, please rate the market requirements for the following systems characteristics. (Please rate on a scale of 1 to 5, where 1 is not needed at all and 5 is absolutely vital).

FEATURE	RATING
Color	______
Resolution	______
Response time	______
System flexibility	______
Interactive use	______
Hardcopy output	______
Micrographics output	______
Other ____________________	______
Other ____________________	______

18. What are your perceptions of the major benefits of business graphics services, now and in 1985. Please rate on a scale of 1 to 5, where 1 is not attributable to the system at all and 5 is an extremely important benefit of the system.

BENEFIT	1981 RATING	1985 RATING
• Increased capability to communicate	______	______
• Savings by reduction of paperwork	______	______
• Increased productivity	______	______
• Improved management decisions	______	______
• Improved comprehension of business alternatives	______	______
• Reduced manual analysis	______	______
• Other ____________________	______	______
• Other ____________________	______	______

Comments: ____

____

____

19. Please rate the importance of price and performance of business graphics services. Rate on a scale of 1 to 5, where 1 is unimportant and 5 is of critical importance.

_____ Price rating

_____ Performance rating

Comments: ____

____

20. Who do you feel are the present leading vendors serving the needs of business graphics users. Please rate (1 to 5) the adequacy of the vendors to meet the needs of business graphics users.

VENDORS	RATING (1 to 5)
• Equipment - Input/output displays	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____
• Equipment - Plotters	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____
• Equipment - CPUs/memory	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____
• Independent software vendors	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____
• Remote computing services vendors	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____
• Professional consulting services vendors	
1. ____________________	_____
2. ____________________	_____
3. ____________________	_____

21. To sum up, how would you describe the characteristics of successful business graphics systems today,

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and how will they be different in 1985.

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